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ANALYSIS OF THE SUPPORT EQUIPMENT REVIEW AND

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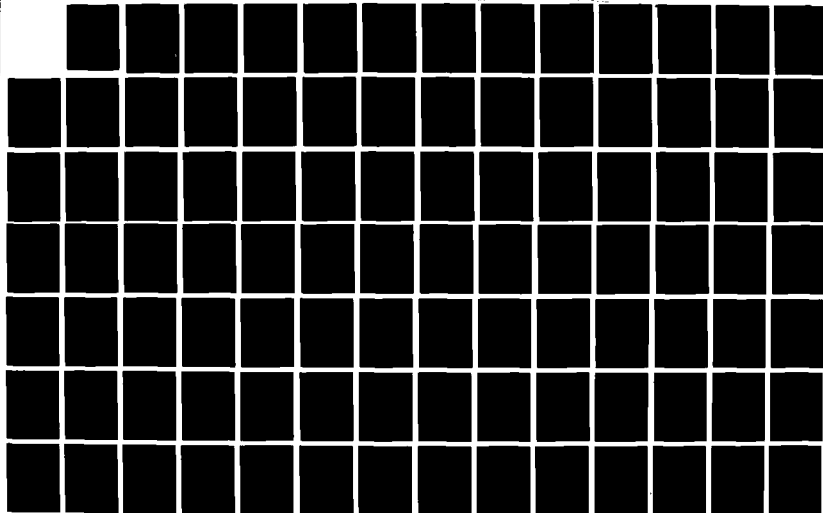
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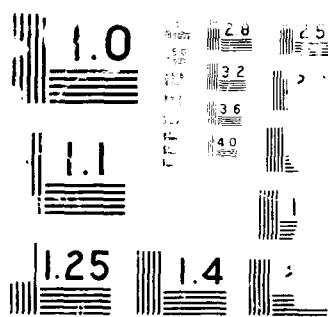
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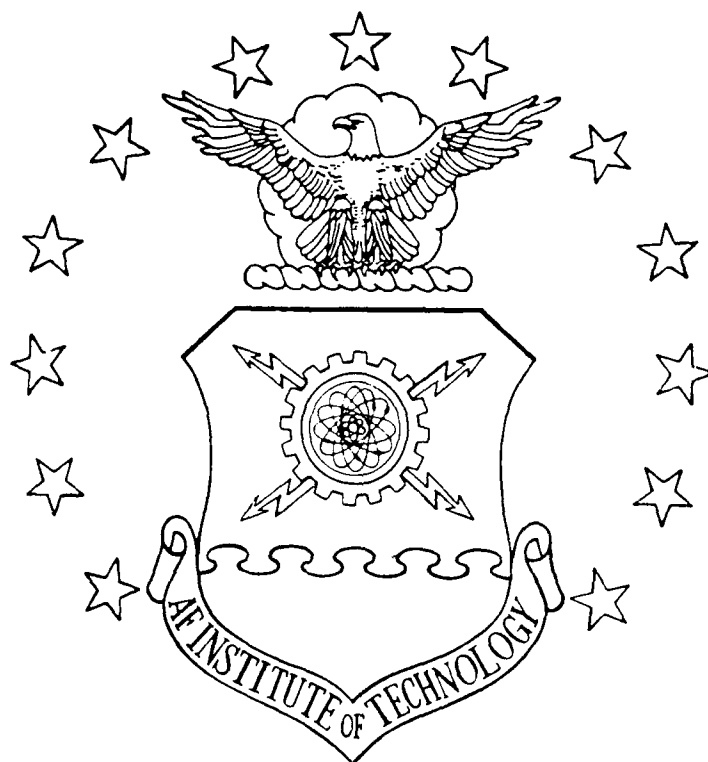
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REVIEW AND APPROVAL PROCESS

THESIS

Joyce F. Bassett
GM-14, USAF

AFIT/GLM/LSM/89S-1

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REVIEW AND APPROVAL PROCESS

THESIS

Presented to the Faculty of the School of Systems and
Logistics of the Air Force Institute of Technology
Air University
in Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Logistics Managment

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GM-14, USAF

September 1989

Approved for public release; distribution unlimited

Preface

This thesis would not have been completed without the support of many people. I would like to thank the support equipment managers at the F-15, F-16 and B-1B system program offices who so willingly took the time to answer my interview questions and who trusted me enough to let me dig through their official SERD files for hours on end collecting the research data. I also want to thank the support equipment provisioning managers at Tinker AFB OK, Robins AFB GA and Hill AFB UT who took the time out of their busy schedule to explain the AFLC SERD review process, its problems and their suggestions for improvement.

A special thanks to Ms Vickie Getter at ASD/ALX for her assistance in locating historical documents and also for keeping me informed about support equipment issues.

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Most importantly, I would like to thank my husband, Ted, who stood beside me as my best friend. He had to put up with a great deal in order that I could fulfill my dream.

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Abstract

There is a direct link between the increasing technological sophistication of our present-day weapon systems and the complexity of the support equipment required to maintain them. With this complexity has also come increased numbers of equipment at increased cost and lead times. In 1988, aircraft and missile support equipment alone totaled over 82,800 line items valued at over 10.5 billion dollars. The support equipment requirements and acquisition process that has evolved over the years is extremely complex and it requires the coordination of many people. As such, it is often characterized as being nonresponsive to the Air Force needs.

Since 1983, there have been numerous Air Force studies to address the support equipment issue. Over 200 recommendations have been made in an attempt to improve the support equipment acquisition process, yet support equipment shortfalls are still a major problem today. A literature review was developed to identify those studies, their conclusions and recommendations.

The purpose of this research was to determine if the current SERD processing is being accomplished within the 75 days required by regulation and to identify where the current

process could be improved. The research was accomplished by selecting a representative sample of SERDs and by interviewing support equipment experts.

This research shows that the average time to review and approve SERDs is 176 days versus the 75 days required by regulation. The research concludes that the current process cannot be routinely accomplished within the 75 days allowed because there are just too many reviewers involved and the action of one reviewer is normally contingent upon the completed action of another. This report addresses problems and backlogs which were identified during the research and makes recommendations to streamline the current SERD processing system.

AN ANALYSIS OF THE SUPPORT EQUIPMENT REVIEW AND APPROVAL PROCESS

1. Introduction

Overview

For every one billion dollars the Air Force spends for the acquisition of a major weapon system, three to five billion dollars are commonly spent to support it during its life time (25:85). A significant part of the logistics system is the equipment required for weapon system checkout, maintenance and repair. This equipment ranges in complexity from relatively simple wrenches to complex computer-controlled automatic test equipment. This equipment is referred to as support equipment. Support equipment includes all of the tools, test equipment, automatic test equipment and related computer programs and software required to support the weapon system at organizational, field and depot levels of maintenance. It does not include the built-in test equipment which is an integral part of the mission equipment nor does it include any of the equipment required to perform mission operation functions (9:11; 8:42-1; 12:2). For a major weapon system, support equipment often involves thousands of line items of equipment and accounts for approximately five to fifteen percent of the weapon system acquisition costs (19:1,2). The acquisition of weapon system support equipment

can be a very complex and time-consuming process. From design identification through approval, contracting, manufacturing, testing and final delivery, support equipment and sustainment remains a very labor-intensive process (25:85). The Program Manager (PM) is assigned to Air Force Systems Command (AFSC) and is the agent for the Air Force in the management of the system acquisition. The PM is the focal point of authority and responsibility for running the program and is also responsible for insuring that the weapon system being developed is adequately supported. A February 1997 memorandum by then Under Secretary of Defense, Dr. Richard L. DeLauer, entitled Acquisition Management and System Design Principles, put renewed emphasis on system readiness, support and personnel.

Resources to achieve readiness will receive the same emphasis as those required to achieve schedule or performance objectives. Support and personnel considerations will be design requirements. Program managers will be responsible for the readiness of their systems and have visibility of, and a voice in, support resource funding. (6:11)

The PM normally delegates this responsibility to the Integrated Logistics Support (ILS) Office which is headed by the Deputy Program Manager for Logistics (DPML) (8:42-43). In the area of support equipment, the DPML is then responsible for insuring that the contractor defines all support equipment required to support and maintain the weapon system in accordance with the approved maintenance plan. The proper introduction of support equipment into the Air Force inventory requires careful interaction between the contractor

and the government during two interrelated processes: the Logistics Support Analysis (LSA) Process and the Support Equipment Recommendation Data (SERD) process (8:42-2).

LSA is an analytical process for influencing the design of a weapon system and defining support system requirements. It involves a continual dialogue between the designer and the logistician to identify, define, analyze, quantify and process all logistic support requirements which includes support equipment. LSA task and data requirements are defined in MIL-STD-1388-1A/2A (5:5-1, 8:23-1). Table 1 lists the five general task sections including 15 tasks and 77 sub-tasks which should be tailored for each individual program.

The data produced as a result of performing these tasks are the Logistic Support Analysis Records (LSAR). The Air Force requires that LSA be used to identify support equipment requirements. These requirements are documented by the contractor on LSAR E-sheets or Support Equipment Recommendation Data (SERDs) which are the output of LSA tasks 401 and 501. The contractor's support equipment recommendations are then submitted to the Air Force for review and approval (9:3).

The SERD, actually a subset of LSA (LSA Output Report LSA-070), is a formal procedure for the government to review contractor recommendations for support equipment and determine the types and quantities of support equipment to be purchased.

TABLE 1
LSA Tasks (5:5-6)

Section	Task	Description
100		Program Planning and Control
	101	Early LSA Strategy
	102	LSA Plan
	103	Program & Design Reviews
200		Mission and Support System
	201	Use Study
	202	System Standardization
	203	Comparative Analysis
	204	Technological Opportunities
	205	Supportability Factors
300		Preparation and Evaluation of Alternatives
	301	Requirements Identification
	302	Support System Alternatives
	303	Trade-Offs
400		Logistic Support Resource Requirements
	401	Task Analysis
	402	Early Fielding Analysis
	403	Post Production Support
500		Supportability Assessment
	501	Test Evaluation and Verification

The LSA-070 report submittal can be in either automated or manual form but must be formatted in accordance with the data item description DI-ILSS-80045 (for SERDs) or MIL-STD-1388-2A (for E-sheets) (8:42-2; 10:1). This research will only address SERDs since they are the most common method of identifying support equipment. Through the SERDs, the contractor identifies required maintenance functions and the

support equipment needed to support that maintenance function. The SERDs also include other data such as calibration or test requirements and the need for technical manuals and provisioning data. The Air Force Systems Command/Air Force Logistics Command (AFSC/AFLC) Supplement 1 to the Air Force Regulation (AFR) 800-12 allows the government 75 days to review and approve SERDs (10:9). The process begins when the contractor sends the SERD to the AFSC System Program Office (SPO), the AFLC System Program Management Air Logistics Center (SPM ALC) and the using command responsible for the weapon system. The SERD and E-sheet approval cycle from AFR 800-12 is included in Appendix A as Figure 2. System Program Office (SPO) personnel review the SERD concurrently with AFLC and using command activities. A detailed description of the SERD review activities will be covered in Chapter IV and a sample of a SERD is included in Appendix B. After completing their internal review and receiving the inputs from AFLC and the using command, the SPO support equipment manager reconciles any differences and forwards the Air Force position to the contractor. It is normally at SERD approval that the Air Force requests the contractor's cost proposal for support equipment development which begins the contracting process.

General Issue

A primary objective of the Air Force in the area of support equipment is to obtain only that equipment which is

absolutely necessary to field a supported system on time and at fair and reasonable prices (9:1; 22:1). Forty years ago, weapon systems were relatively simple and the resources to support them were more readily available. A weapon system could be designed and produced in a minimum amount of time and logistics support, including support equipment, were often considered as an afterthought. When support equipment was late, workarounds were fairly easy to devise because of the simplicity of the equipment (21:16). Today's sophisticated weapon systems require highly technical, complex and expensive support equipment to keep them operational. The time required to acquire these complex support systems is longer and workarounds are much more difficult to find. Support equipment can no longer be an afterthought but must be considered as a vital integral part of the total weapon system.

The inadequacy of the support equipment planning process and the resulting problems began to surface during the 1970s and has continued at an increasing rate throughout the 1980s. During this time period, numerous weapon systems such as the F-15, F-16, A-10 and B-1B aircraft entered the Air Force inventory. However, they experienced problems resulting in shortages and "late to need" deliveries of required support equipment (24:2). Col David O. Scheiding, Chairman of the San Antonio Management Analysis Group (SAMAG) which reviewed support equipment issues, states that:

support equipment has had a history of nagging shortages and "late to need" deliveries of required equipment. The majority of the problems are systemic in nature and result due to the overall system which the Air Force uses to acquire and manage support equipment for its weapon system which has evolved over the years. (24:1)

The number of items of equipment together with the associated cost of this inventory reflect the high investment the Air Force has in support equipment. For instance, the fiscal year 1988 inventory of aircraft and missile support equipment alone totaled over 82,800 line items which included over two million pieces of support equipment valued at over 10.5 billion dollars (24:2). These figures should encourage the same level of attention to the acquisition of support equipment as is given to the weapon system it supports.

Problem Statement

The focus of this research is on current SERD processing procedures. The research will review the SERD review process to determine if it is being accomplished within the time requirements of Air Force policy. Current procedures of the SERD review process will be examined to determine if they are realistic and achievable and whether they adequately meet the demanding needs of today's Air Force weapon systems or whether they are outdated and in need of revision.

Investigative Questions

The following research questions will be used to guide this investigation:

1. Are SERDs being reviewed and approved within the required 75-day review cycle?
2. If no, what is the average SERD review time and where are the delays occurring?
3. What constraints does the support equipment manager perceive as significant?
4. Can the current SERD review process be streamlined to permit a more timely decision while insuring that Air Force support equipment objectives are met?

Limitations of the Study

In 1984, Congress passed three significant pieces of legislation that had a major impact on spares and support equipment management: (1) the Competition in Contracting Act (CICA), (2) the Defense Procurement Reform Act and (3) the Small Business and Federal Procurement Competition Enhancement Act. This legislation came about as a result of the spares and support equipment overpricing "horror" stories that hit the newspapers in 1983. The purpose of the legislation was to increase competition in weapon systems and ensure fair and reasonable prices for all spares and support equipment purchases (26:6,7). While there have been benefits and savings from the many acquisition reforms, there have also been negative impacts. For instance, the reforms have increased tremendously the workloads of the buyers and the program managers which in turn increased the administrative lead times required to contract for support equipment following SERD approval (26:7). This research will be limited to the activities occurring between SERD submittal and SERD approval. It will not attempt to address the

activities following SERD approval; however, the potential for longer administrative lead times only makes the timeliness of the SERD approval process more critical.

There is an AFSC/AFLC Acquisition Support Steering Group which has recommended some major changes in budgeting and funding responsibilities for support equipment. Their recommendations include changing the definitions of peculiar and common support equipment to initial and replenishment and changing the budgeting and funding responsibilities of the implementing and supporting commands. Their recommendations have been briefed to the Air Staff but have not been approved for implementation (17). Therefore, that issue will not be addressed in this research.

Definition of Terms

For the purpose of this research, the following terms and definitions will be used (9:9,10).

Common Support Equipment (CSE). An equipment item applicable to more than one system, subsystem or item of equipment. It has a national stock number assigned and is currently in the Air Force inventory.

Peculiar Support Equipment (PSE). An equipment item applicable to one system, subsystem or item of equipment. It is an equipment item that is being introduced into the Air Force inventory for the first time or a CSE item that has been reconfigured for a specific function or purpose. PSE normally does not have a National Stock Number (NSN) assigned at the time that it is first identified but the NSN is assigned during the SERD review process.

Contractor Furnished Equipment (CFE). Items acquired or manufactured directly by the contractor for use in the system or equipment under contract. CFE support equipment is normally peculiar equipment which is unique to a particular weapon system. It normally does not have a National Stock

Number (NSN) assigned at the time that it is first identified but the NSN is assigned during the SERD review process.

Government Furnished Equipment (GFE). Items in the possession of, or acquired directly by the government, and later delivered to or otherwise made available to the contractor for integration into the system or equipment. GFE support equipment is normally common equipment which is stocklisted and available in the Air Force inventory.

Organization of the Study

This research study is reported in the remaining five chapters. Chapter II provides a chronological development of happenings and events relating to support equipment acquisition. Included in the discussion are reports of research conducted by several Air Force groups in an attempt to identify and resolve some of the support equipment issues.

Chapter III describes the methodology used to accomplish the research, analyze the research problem and answer the research questions identified in Chapter I. The methodology is developed as a two phase process. Key areas described are the nature and sources of data, the data collection process, problem identification and development of solutions.

Chapter IV examines the specifics of the Support Equipment Recommendation Data (SERD) review process. It will describe the step-by-step review and approval cycle which the SERD follows.

Chapter V analyzes the data collected from the three samples of SERD files and interviews with support equipment experts. The procedures described in Chapter III will be used to process and analyze the data.

Chapter VI summarizes the research findings, provides the researcher's conclusions to the research findings and presents recommendations for further research.

III. Literature Review

Background

As technology surged ahead in the 1950s and 1960s, the acquisition of major weapon systems went from the high-volume, low-unit cost of World War II to a complex low-volume, high-unit cost (1:146). However, in many ways our acquisition processes have not kept up with this change. In 1982 General James P. Mullins, then commander of Air Force Logistics Command, gave an address at the Air Force Association's National Symposium in Los Angeles entitled "Innovation and Industry: The Key to Survival" where he stated:

It's been said that "The past is a foreign country, they do things differently there." But obviously this doesn't refer to the defense business, for in the area of weapons procurement and support, we're living in the past. We don't do things differently today - we do them just like we did them decades ago - in another day and another age. The problem is that this way of doing things isn't working today. (22:1)

There is a direct link between the increasing technological sophistication of our present-day weapon systems and the complexity of the support equipment as well as the lengthy four to five year lead times it takes to acquire this equipment. This often impacts our ability to support a new weapon system (7:23). The support equipment requirements and acquisition process that has evolved over the years is extremely complex and it requires the coordination of many people within four different commands:

Air Force Systems Command, Air Force Logistics Command, Air Training Command and the using command. It requires many interfaces having to mesh properly at the right time if the item is to be acquired and delivered on time. As such, it is often characterized as being nonresponsive to the Air Force needs (24:1-3). This problem stems from a basic management philosophy that support equipment requirements can and must be identified far enough in advance so it can be procured and delivered in time to meet initial weapon system deliveries (9:3; 8:42-3). However, since this identification process is dependent upon the design stability of the weapon system, it is often impossible to identify support equipment that early in the design process. For those systems where it is possible, there is risk involved in designing the support system before the design of the weapon system itself has been baselined.

Acquisition Logistics Division

In 1976, the Air Force Acquisition Logistics Division (AFALD) was established at Wright-Patterson AFB OH under Air Force Logistics Command. It was the first organization dedicated to encouraging decision makers to consider life cycle cost and logistics support impacts. In October 1983, AFALD was changed to the Air Force Acquisition Logistics Center (AFALC) and it came under the joint direction of Air Force Logistics Command and Air Force Systems Command. In June 1989, AFALC was renamed the Acquisition Logistics

Division (ALD). To prevent confusion, it will be referred to as the ALD in this thesis.

AF Management Analysis Group

There have been significant efforts by the Air Force to address these issues. In 1983, an Air Force Management Analysis Group (AFMAG) was established to perform a comprehensive study on spare parts acquisition which also addressed support equipment issues. While spares and support equipment acquisition have some similarities, the key difference is support equipment requires a support structure and spares do not. The support structure includes (27:85):

1. Support Equipment for Support Equipment (SE for SE)
2. Technical orders for operating the SE
3. Calibration support
4. Spare parts for the SE and the SE for SE
5. Training for the SE and the SE for SE
6. Engineering data for the SE and the SE for SE

In the area of support equipment, the AFMAG primarily addressed the issue of proliferation. Their finding states that delayed development of SERDs, lack of support equipment acquisition plans, short suspenses and immediate operational requirements limit the Air Force's ability to challenge the requirements and attain standardization. They recommended a phased identification approach concurrent with system design stability (14:81-83). However, they did not address the

effects that program concurrency can have on support equipment availability. An August 1988 report by the Congressional Budget Office on Concurrent Weapons Development and Production suggests the practice of allowing development and production to overlap or proceed concurrently is a principal contributor to program problems. However, they also noted that concurrency can provide certain advantages such as cost savings and shortening the time required to field a new system. Out of their sample of 31 major programs, 13 were classified as highly concurrent (29:vii,viii).

The AFMAG recommended future Program Management Directives (PMDs) require a Support Equipment Acquisition Plan be developed during the Full Scale Development (FSD) phase of the weapon system (14:83). Air Force Regulation (AFR) 800-12, dated 13 December 1985, requires a support equipment strategy be developed before FSD which is to be included in the weapon system Program Management Plan (PMP). The strategy must address how the support equipment acquisition, including long-lead-time items, will be time-phased and funded (9:2). In addition, the Aeronautical Systems Division Regulation (ASDR) 800-25, dated 25 August 1988, requires the support equipment strategy be developed concurrent with and as an integral part of the acquisition strategy for the prime weapon system and that it be addressed in the Support Equipment Plan (12:3).

Support Equipment Acquisition Review Group

As a result of the 178 recommendations from the AFVAB study and at the request of the Assistant Secretary of the Air Force for Research, Development and Logistics (SAF/RAL), a Support Equipment Acquisition Review (SEAR) Group was formed. The group was chartered by the Commanders of Air Force Systems Command and Air Force Logistics Command. The SEAR Group was established in March 1984 to perform an in-depth review of the entire support equipment acquisition process and assess the operational impacts of this process. The group consisted of support equipment experts from throughout the Air Force, including representatives from most major commands. They concluded the lack of support equipment is not impacting the peacetime mission accomplishment even though the using commands all reported support equipment shortages, with a cumulative value of over \$1.5 billion. The SEAR group found extensive workarounds and personal ingenuity were being used to accomplish the mission. However, they felt support equipment shortages could cause potential mission impacts in the future, depending on mission requirements (27:1). The SEAR Group addressed the issue concerning Logistics Support Analysis (LSA) and Support Equipment Recommendation Data (SERD) guidelines and procedures not being effective in identifying and reporting support equipment requirements. They found SERD processing procedures are cumbersome and expensive. In some programs,

as many as 62 different organizations participated in the review process and as many as 150 SERDs per month were reviewed during the time critical development phase of the program. Many programs had developed their own unique SERD tracking systems to track the status of these documents. They pointed out that although the Air Force conducts multiple reviews of each SERD, these efforts seldom result in major changes such as changing an item from Contractor Furnished Equipment (CFE) to Government Furnished Equipment (GFE). They also found much of the SERD volume results from the processing of minor changes to previously submitted SERDs. Regardless of the importance or the magnitude of the change, all SERDs on a particular program followed the same distribution and review cycle. They felt many manhours were being wasted in processing minor, administrative changes (27:75,77).

The SEAR Group recommended the Acquisition Logistics Division (ALD) develop a common SERD tracking system for use by all support equipment acquisition agencies. They also recommended an abbreviated SERD processing procedure be developed for minor changes or updates to SERDs (27:78,79).

The December 1985 revision to AFR 800-12 contains an abbreviated SERD approval cycle, a copy of which is contained in Appendix A as Figure 3. The regulation directs use of the abbreviated process for minor changes or updates to E-sheets or SERDS (9:3). However, an Air Force audit conducted between September 1986 and March 1987 found the abbreviated

process was not being used. When the Air Logistics Center (ALC) received a group of SERDS on a contractor submittal letter, they would attach AFLC Form 726, Provisioning Document Control, to the group of SERDs which were then routed through the numerous ALC offices responsible for provisioning and requirements determination. The SERDs were processed as a batch and all SERDs were processed through the same process regardless if it was for a new item or for a minor revision (23:3). To add to the confusion, the Aeronautical Systems Division Regulation (ASDR) 800-25 issued 25 August 1988, which covers the policy for managing support equipment for ASD systems, directs ASD organizations to process SERDs in accordance with the flow chart included in Appendix A as Figure 4. The ASD regulation does not address use of an abbreviated review cycle for minor changes to SERDs (12:3,10).

Thesis on Support Equipment Acquisition

In September 1985, Captain Mark L'Ecuyer, a graduate student at the Air Force Institute of Technology, published a thesis which looked at the support equipment acquisition process and methods of improvement designed to reduce acquisition costs within Air Force Systems Command. He suggests one major problem in the weapon system acquisition process is a general lack of understanding of the entire logistics process, and support equipment in particular (19:6). His research points out that, historically, the

support equipment acquisition process has been inefficient and cumbersome due to the stringent regulations and guidelines limiting the innovation of the support equipment manager (19:66). He describes how the support equipment acquisition process is related to the major weapon system acquisition process and how the SERD process functions. He found that the SERD process is very detailed and requires the input of many hundreds of people to make it work. He stressed the importance of understanding the SERD process in order to assure the most cost effective and timely delivery of support equipment to the using command (19:94). The primary purpose of his research was to investigate several alternative acquisition methods previously identified by the Support Equipment Acquisition Review (SEAR) Group for reducing support equipment acquisition costs. These alternatives include multi-year contracting, breakout procurement and local manufacture of support equipment (19:69-87). Captain L'Ecuyer states the purpose of his study is not to criticize the present methods of procuring support equipment but rather to present an examination of those methods. However, he does acknowledge that the present methods of support equipment acquisition have received a great deal of criticism. He recommends further research to examine the problems with the present system and look for ways to reform it (19:99).

AF Audit Report

In January 1988, the Air Force Audit Agency issued a report entitled, "Support Equipment Recommendation Processing and Associated Logistics Support Planning." The audit was conducted during the time period September 1986 through March 1987. The auditors reviewed five weapon systems: the B-1B bomber, F-15 fighter aircraft (C, D and Multi-Staged Improvement Program (MSIP) models), E-3A reconnaissance aircraft, Peacekeeper missile, and the General Electric F101-GE-102 engine used on the B-1B aircraft. The objective of the review was to evaluate whether contractor support equipment recommendations were processed within the established 75-day time frame required by Air Force regulation and also to determine whether adequate decisions were made to insure logistics support for this equipment. Specifically, they were trying to determine whether: (1) support equipment recommendation processing and associated contracting resulted in delivery of support equipment by the specific need date and (2) support equipment recommendation reviews effectively identified the need for support equipment spare parts, technical orders and testing. The audit was accomplished at Headquarters Air Force (USAF), Headquarters Air Force Systems Command (AFSC) and three AFSC product divisions, Headquarters Air Force Logistics Command (AFLC) and four air logistics centers, the AFLC Cataloging and Standardization Center, two using command headquarters and four operating bases. The results of the audit concluded

that support equipment recommendation processing was not timely but adequate logistics support decisions were being made for support equipment (23:1-5).

In the area of Support Equipment Recommendation Data (SERD) processing, they reviewed a total of 266 SERDs for the 5 systems and found that 245 or 92 percent were late (were not approved within 75 days). The average processing time for the 245 SERDs was 199 days. Table 2 shows the average processing time by weapon system. Data was not available to determine the average review time at the using commands.

TABLE 2
Average SERD Processing Time (23:14; 30)

Weapon System	SERD Status			Average Review Days		
	On Time	Late	Total SERDS	At ALC	At SPO	TOTAL
B-1B	0	48	48	103.0	58.8	161.8
F-15	10	45	55	140.3	46.6	186.9
F-101-GE	7	64	71	79.6	83.4	163.0
E-3A	2	29	31	100.0	102.1	202.1
Peacekpr	2	59	61	116.3	163.0	279.3
Total	21	245	266	107.8	90.8	198.6

Although the auditors could not establish a clear cause and effect relationship between late SERD approval and late support equipment delivery, they did find that untimely

processing of SERDs caused delays in contracting and contributed to support equipment not being available by the need date (23:8). They felt the use of Undefined Contract Actions (UCAs) by four of the five System Program Offices (SPOs) to expedite support equipment contracting demonstrated this point (23). The use of UCAs would have minimized the operational impact of late SERD approval by allowing the delivery of the support equipment approximately twelve months sooner than under the routine contracting system. They also found two of the program offices had ordered support equipment prior to the formal SERD approval (23:11). This would indicate the SERD system is essentially being ignored and certainly is not fulfilling the objective it was designed to accomplish (24:45).

The audit determined the conditions occurred primarily because: (1) AFLC provisioning personnel and AFSC support equipment managers accumulated and processed the SERDs in batches rather than individually and (2) AFLC provisioning personnel did not have an effective system to track and follow-up on SERDs that exceeded the processing time standard (23:8). They found four of the five SPOs and all of the ALCs used batching of SERDs which contributed to the excessive time required to review and approve SERDs. When SERDs are batched, a problem with one SERD holds up the review of all SERDs in that batch. They also found only one ALC had a SERD tracking system and three of the five SPO tracking systems were not updated properly (23).

The audit report recommended that both Headquarters Air Force Systems Command (HQ AFSC) and Headquarters Air Force Logistics Command (HQ AFLC) issue policy direction requiring support equipment managers and provisioning personnel to process SERDs individually or in small batches rather than accumulating and processing them in large batches. They also recommended HQ AFLC assist the air logistics centers in developing an automated system for tracking individual SERDs and for identifying SERDs which require follow-up (23:9,10).

As a result of these recommendations, HQ AFSC and HQ AFLC both issued interim policy letters in mid 1987 to the product division acquisition logistics functions, the air logistics center provisioning personnel and to the Cataloging and Standardization Center concerning the timely processing of SERDs. They also indicated a formal policy change to AFSC/AFLC Supplement 1 to AFR 800-12 would be issued by 1 Jun 1988 (23:9,10). The change never occurred because a decision was made by Air Staff to totally revise all AFR 800 series regulations by combining the thirty-eight regulations into two regulations, AFR 800-1 and 800-2. However, during the final coordination of AFR 800-2, the decision was made to remove the detailed instructions in AFR 800-2 and put it into an AFR 800-3. AFR 800-2 will serve as a working guide for the program director/manager while AFR 800-3 will include the policy for the specific functional areas. Support equipment

policy will be included in AFR 800-3 which is currently in outline form awaiting approval by SAF/AQ (16). This means it will probably not be issued before 1990. After issuance of AFR 800-3, an AFSC/AFLC Supplement will be issued which will include this policy change (23:9,10; 16). The researcher is concerned that policy letters are only effective for a limited length of time and the regulation change will not be available in the near future.

The auditors interviewed equipment specialists on all five systems, and while they found them to be very knowledgeable about the equipment, none of the equipment specialists interviewed used any sort of checklist when reviewing SERDs to insure all critical areas were covered correctly. Instead, they found the criteria used in evaluating SERDs was judgmental and based on the individual's personal experience and knowledge (23).

In the area of SERD tracking, HQ AFSC and HQ AFLC have agreed to jointly use the modernized Air Force Equipment Management System (AFEMS) to process and track SERDs. However, the AFEMS Modernization Project is not scheduled for completion until July 1993 (23:11; 4).

AF Office of Support Equipment Management

Program Management Directive (PMD) 7248(1)/64704F, dated 22 April 1987, directed the establishment of an Air Force Office of Support Equipment Management (AFOSEM). While Air Force Logistics Command (AFLC) was designated as the

implementing command, Air Force Systems Command (AFSC), Air Training Command (ATC) and the using commands were designated as participating commands (13:1). The AFOSEM was established in response to recommendations in previous studies to centralize support equipment acquisition management (24:28). The PMD identified the following eight objectives for promoting standardization and improving interoperability (13:2-3):

1. Develop and maintain the Air Force Support Equipment Master Plan (SEMP).

2. Establish management approaches to control the proliferation of support equipment.

3. Establish methods for determining reliability and maintainability goals for support equipment.

4. Evaluate the standardization potential of candidate support equipment items.

5. Initiate hardware development of proposed standard support equipment to demonstrate and validate the feasibility of proposed standards.

6. Initiate development and plan for implementation of approved support equipment standards and specifications.

7. Ensure the integration and appropriate interfaces for automated databases to support equipment acquisition.

8. Update, maintain and automate MIL-HDBK-300.

In early 1988, personnel from the AFOSEM briefed Gen Gillis, who was then Commander of the Acquisition Logistics Division (ALD), on ways to achieve earlier depot activation by making depot support equipment available earlier (2). They recommended two possible alternatives to the way the Air Force currently acquires support equipment. One, was to

purchase support equipment as a capability versus by individual item as is normally done today. The C-17 program is currently using this concept for acquiring all peculiar support equipment for the organizational and intermediate levels of maintenance (17). The second recommendation suggested that the SERD review process could be shortened by giving the SPOs the capability to use the existing and planned support equipment computer tracking systems which are being expanded to provide better visibility into existing inventory items. An example is the Support Equipment Acquisition Management System (SEAMS) which is being developed to provide support equipment managers visibility into all support equipment including items not included in MIL-HDBK-300, such as standard hand tools (20).

The recommendation also included developing an expert system to assist the AFLC managers in determining support equipment requirements during the SERD review process (20). An expert system is a set of computer software which allows a user to take advantage of the knowledge and experience of a recognized expert to solve complex and difficult problems (3:4). Major Mary Kay Allen, while serving as Senior Advisor to the Commander of Air Force Logistics Command (AFLC) for Artificial Intelligence, helped AFLC develop an expert system to improve inventory management. The results have been impressive. Item managers who used the expert system scored ten percent higher than those who did not use the expert system to calculate requirements (3:8).

These recommendations were briefed to personnel from the Material Management Directorate at HQ AFLC and a group of support equipment managers from San Antonio. Figure 1 shows the AFOSEM's recommendation for revising the SERD approval process and reducing the time required to review and approve support equipment. However, the AFLC group felt that this revised SERD process excluded AFLC from the review process which would result in increased risk of support equipment proliferation. They nonconcluded with the change and the recommendation never proceeded past that point.

San Antonio Management Analysis Group

In August 1987, the Director of Material Management at the San Antonio Air Logistics Center directed that a San Antonio Management Analysis Group (SAMAG) study be accomplished to provide recommendations to the newly created AFOSEM concerning both long and short term solutions to the Air Force's support equipment problems. They also looked at ways that the recommendations could be implemented locally to improve the management of San Antonio managed support equipment items (24:ii). The purpose of the SAMAG effort was not to reiterate previously defined issues but to provide a working level "micro" look at what progress had been accomplished and to point out where additional effort was needed. They looked at 25 specific problems which can be grouped under four broad areas (24:iv-v):

1. The historical absence of a central Air Force manager for support equipment.

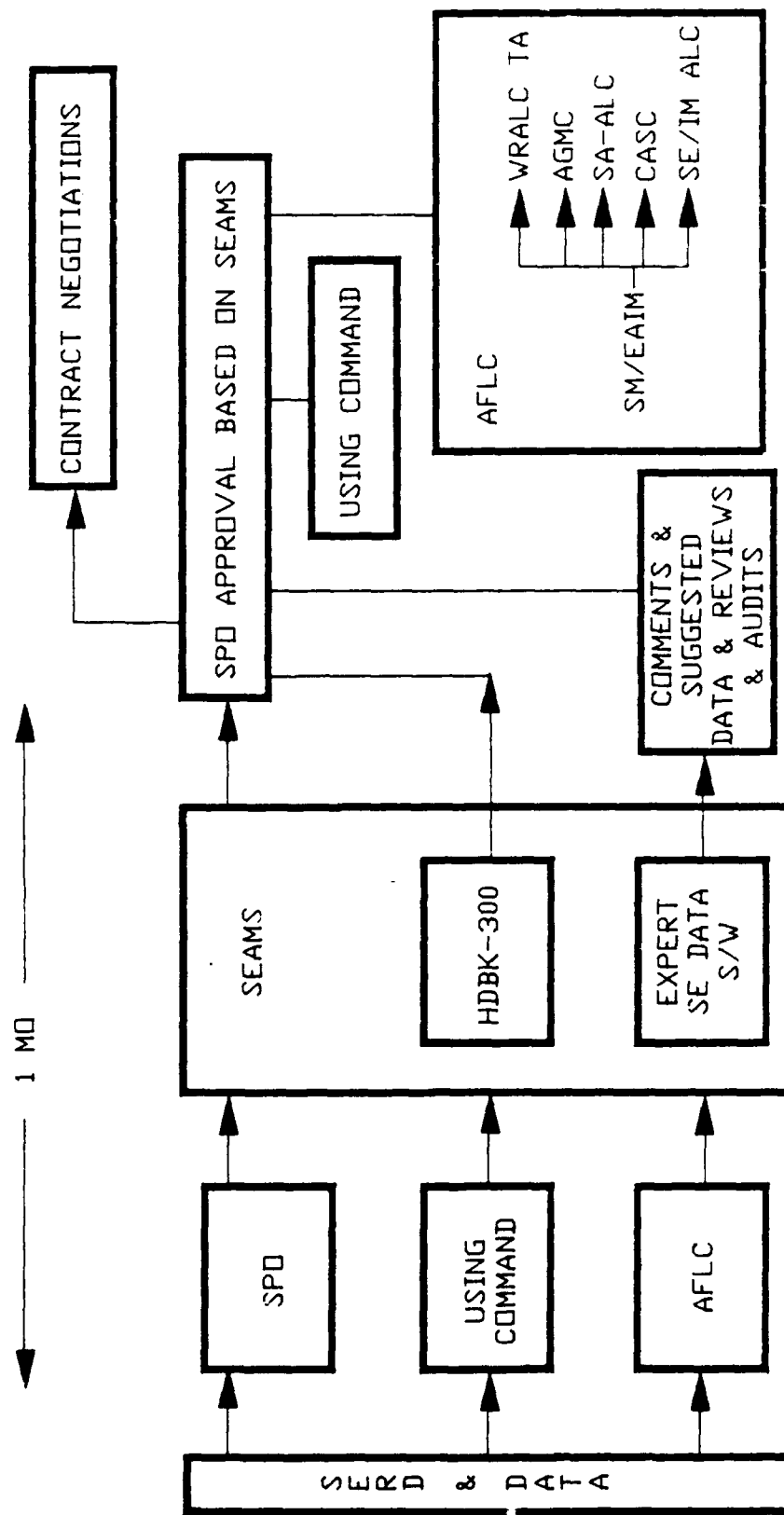


Figure 1. AFDSEM Recommended SERD Review Cycle

2. The outdated, off-line grouping of independent computer systems that make up the Air Force Equipment Management System (AFEMS) and their related interfaces.

3. The lack of visibility of the necessary data required by the System Program Managers (SPMs) and the Inventory Management Specialists (IMs) in order to perform their assigned duties.

4. The incompatibility of the basic underlying management philosophy and current directives for support equipment management with the present system and the current environment.

In the area of delinquent SERD processing, the SAMAG Study supported the earlier findings of the SEAR Group and the Air Force Audit Report. For example, when a manager was assigned the task of monitoring the support equipment for the C-5 transport aircraft, there was a backlog of over 1500 transactions to be processed but no SERD tracking system available to assist in that process. Therefore, the San Antonio Air Logistics Center, with the help of the C-5 prime contractor, developed a unique tracking system for tracking C-5 SERDs. This is an example of a workaround system developed because of a weakness in the Air Force system (24:45-46).

The Support Equipment Acquisition and Control System, often referred to as the C013 System, is the AFLC system for providing requirements forecasting and asset visibility. It was designed to assist the inventory managers in identifying and preparing support equipment forecast requirements by providing visibility as to the availability of authorized support equipment required for specified activation dates.

Although the CO13 system has numerous deficiencies, it is currently the only system available to AFMC managers for providing support equipment availability status. Previous audits of the CO13 system contributed the low accuracy and reliability of the system to (1) the absence of an interface with AFSC's Acquisition Management Information System (AMIS) for status on AFSC procured support equipment items and (2) the laborious task required for inventory managers to manually update the system (24:35-36).

The SAMAG recommended that the Air Force develop a standard SERD tracking system which would provide visibility by weapon system to both AFMC and AFSC. They suggested that the modernized Air Force Equipment Management System (AFEMS) would be the logical place to implement this capability and they stressed the critical need to provide this capability as soon as possible (24:46).

AF Equipment Management System

The AFEMS is an Air Force equipment data base designed to provide requirement, status and other information to AFMC, AFSC and the using commands. The present AFEMS system is really a grouping of 27 different data systems of which ten independent systems perform the core functions for support equipment management (24:12). AFEMS is basically a collection of off-line tracking system programs that are batch processed. The current AFEMS has proven inadequate because it fails to provide the necessary visibility to

system program managers, item managers and support equipment managers that is needed to effectively manage support equipment (24:12,14). As a result, a major upgrade to the current AFEMS has been directed. Program Management Directive (PMD) 7233(1), dated 9 March 1987, directs the planning and implementation of a single modernized Air Force Equipment Management System (AFEMS). The modernized AFEMS program went into source selection in May 1989 with contract award scheduled for November 1989. The modernized AFEMS is scheduled to be operational by July 1993. The goal of the modernized AFEMS is to have the capability to transmit digitized SERDs to all organizations who currently review the SERD through the manual process. At this point, there is still a degree of uncertainty as to whether the technical capability to provide the SERD line drawings over AFEMS is within the technical capability of the existing AFEMS budget. Until source selection has been completed, it is unclear as to what capability the modernized AFEMS will provide. There is a potential that the capability to transmit the entire SERD over AFEMS will have to be delayed pending additional funding (4). The modernized AFEMS will still greatly enhance support equipment management by providing the visibility needed to forecast and track support equipment status.

Support Equipment Reports Analysis Team

In August 1988, a Support Equipment Reports Analysis Team (SERAT) was established at HQ AFLC to review the

recommendations from previous support equipment studies to determine what additional actions were required to correct continuing support equipment problems. The SERAT was chaired by the Tactical Airlift Division at the Logistics Operational Center (LOC) and included representatives from within the LOC, the Material Management and Contracting Directorates at HQ AFLC, the AFOSSEM and Air Staff (28:2-3). Their primary objective was to answer this question:

If the previous studies asked all the right questions and if all the responses to the recommendations were appropriate, why do we still have support equipment problems? (28:1)

The SERAT was specifically tasked to avoid "reinventing the wheel"--i.e., beginning another independent study on support equipment issues and problems. Instead, the team was to review each recommendation from previous reports to see what actions had resulted. In November 1988, the results of the SERAT were briefed to senior AFLC leaders and the SERAT Final Report was published on 12 April 1989. The focus of the report was on (1) where the USAF, particularly AFLC, stands on resolving support equipment problems, (2) whether or not actions taken or in work will fix the problems and (3) what needs to be done next. The three reports chosen for review by the SERAT were the SEAR Report, SAMAG and an F-16 Supportability Review. Table 3 provides a list of the SERAT findings. The SERAT found that of the 154 total recommendations offered in these reports, all had been closed in the SEAR and F-16 reports while 21 of the 34 SAMAG

recommendations had been closed. Of the closed recommendations, the SERAT subjectively determined that approximately 77 percent were implemented as intended by the groups who made the recommendations. The SERAT found that approximately 23 percent of the recommendations were either disapproved for implementation or were not implemented as intended by the group making the recommendation.

TABLE 3
SERAT Recommendation Analysis (28:27)

	Properly Implemented		Improperly Implemented		Disapproved		Open	
Report	Crit	Non Crit	Crit	Non Crit	Crit	Non Crit	Crit	Non Crit
SEAR	8	76	12	5	3	3	0	0
F-16	4	6	1	2	0	0	0	0
SAMAG	2	13	0	0	0	6	6	7
Total	14	95	13	7	3	9	6	7

The SERAT found that this 23 percent contained many of the recommendations which were most difficult to implement and which were critical to improving the support equipment process. These "difficult" items were distributed over five basic areas (28:3):

1. Increase the emphasis on effective management at all levels of the Air Force leadership structure.
2. Influence the early weapon system design in order to minimize support equipment requirements and to drive design into common rather than peculiar support equipment.

3. Improve the accuracy of forecasting methodologies.
4. Improve the effectiveness and efficiency of the budgeting and procurement processes.
5. Improve the decision processes to allocate existing assets.

The SERAT had two primary criticisms of the previous reports. One, that they did not prioritize the recommended actions and as a result, the minor problems tended to get the same attention as the critical problems. Two, that many of the recommendations were passive in nature resulting in less than fully successful corrections (28:6).

The report identified twelve recommendations (28:6-23). Recommendations considered relative to this thesis include (1) ensuring that critical elements of written policy and regulations are clearly defined, (2) having the AFOSEM chair a small team of systems acquisition, logistics and contracting people from AFLC and AFSC to develop contract clauses for use in acquisition and modification contracts to incentivize the contractor to minimize support equipment requirements and (3) using the F-16 support equipment tracking system until the modernized AFEMS is operational.

The SERAT meets quarterly to review the status of open action items and to monitor support equipment issues (20). HQ AFLC's decision to establish the SERAT is indicative of the high level attention which support equipment is beginning to receive.

Summary

This literature review shows that since 1983 there have been several major support equipment study efforts conducted in an attempt to improve the support equipment acquisition process. Over 200 recommendations have been made towards achieving this goal yet support equipment shortfalls are still a major problem area today.

Chapter III will describe the methodology used in conducting the research, analyzing the data and answering the research questions.

III. Methodology

Overview

This research effort was divided into two phases of investigation. Phase I was conducted to determine if the current average SERD processing time exceeded the 75 day review cycle authorized by Air Force regulation. Phase II was conducted to identify areas where the current SERD review process could be improved to (1) meet the 75 day review cycle (if it is not being met) or (2) reduce the 75 day review cycle by making recommendations for changing the current SERD process procedures.

Research Strategy

Phase I. A representative sample of SERDs was made to determine the average SERD processing time. Based on a literature review of recent studies in the area of support equipment acquisition, a decision was made to review a sample of SERDs from three ASD programs; the B-1B, F-15 and F-16. In order to provide a longitudinal evaluation of the timeliness of SERD processing, two of the programs were chosen to be re-evaluated following their review in Air Force Audit 6036419, entitled "Support Equipment Recommendation Processing and Associated Logistics Support Planning." The audit reviewed two groups of SERDs; (1) those approved before 31 March 1985 and (2) those approved between 31 January 1986 and 31 March 1987. This research reviewed SERDs approved between 1 April

1987 and 31 March 1989 to determine if the recommendations in the audit report resulted in improving the average SERD processing time. The Air Force Audit reviewed five weapon systems including systems managed at ASD, ESD and BMO. Their findings indicated no significant difference in the SERD processing time of weapon systems managed at the three different locations (23:14: 30). Therefore, this research only reviewed systems managed at ASD. This decision was made based on the accessibility to ASD SERD files, the ability to personally interview the system support equipment managers and the time constraints involved in this research project. In addition to reviewing SERDs from two of the programs included in the previous audit review, the researcher selected a program which had not been previously audited on SERD processing. This action was taken to provide research reliability by insuring that any improvements found were attributable to policy changes directed towards all programs and were not unique to only those programs included in the audit review. This decision was made even though the audit report resulted in no direct findings against the programs themselves but rather resulted in policy changes concerning batching SERDs and tracking SERD status. The F-16 program was chosen because of its similarity to the other sample programs and its position in the acquisition cycle.

In order to provide a 95 percent confidence that the sample results would be representative of the entire

population of SERDs, the size of the sample was calculated using the sample size formula found in "A Guide for the Development of the Attitude and Opinion Survey." (11) Stratification sampling was chosen over simple random sampling to provide a more efficient statistical analysis. Stratification provided information on the three individual programs as well as information on the total population characteristics. The strata sample size for each of the three programs were selected proportionate to the program's share of the total population. In other words, a representative sample of SERDs were selected from each of the three programs based on the total population of SERDs which had been approved between 1 April 1987 and 31 March 1989 on each program. A simple random sample was then taken within each stratum. The sampling results were then combined to obtain accurate population estimates. This sampling procedure was chosen because it provides a higher statistical efficiency than does a simple random sample and it also provides a self-weighting sample. In this case, the population mean could be estimated by simply calculating the mean of all sample groups. In Business Research Methods, C. William Emory notes that this method of proportionate stratified sampling provides little advantage over simple random sampling if the sample means and variances turn out to be similar (15:308).

Phase II. The decision to perform Phase II was based on the assumption that even if the results in Phase I

indicate that the average SERD processing time is meeting the 75-day requirement in the regulation, the current procedures in the regulation may be outdated and in need of revision. The manual SERD review process that is currently used has been in use for many years with only minor changes. The question arises as to whether this complex system could be streamlined. Phase II is actually a subset of Phase I. Data was collected on the sample SERDs reviewed in Phase I in an attempt to identify the decision processes which occur during SERD review. The primary goal was to identify those decisions which are critical to the support equipment design decision (contractual go ahead) and those decisions which, although important, are not critical to the design decision and could be provided after contractual go ahead.

Interviews were conducted with support equipment experts to complete the history of support equipment acquisition and to get a better understanding of the problems faced by support equipment managers in the present environment. Emory notes there are real advantages to interviewing. He points out that this method of gathering information provides great depth and detail of information and also allows for exploration of areas not recognized by the researcher as important until addressed by a respondent. However, he also notes that interviews can be costly both in money and time. This involves the cost of traveling to and from the interview location and the cost of time required to conduct the

interview. Also, busy managers may be reluctant to grant long personal interviews due to constraints on their time (15:160,161).

Because of the proximity of AFIT to the support equipment managers in the system program offices and other staff agencies, personal interviews were conducted whenever possible. Interviewees were initially contacted by telephone to explain the research project and request a personal interview. The interview questions contained in Appendix D were used only as a guide as respondents were encouraged to discuss any thoughts they had concerning the current SERD process. Due to cost and time constraints, telephone interviews were conducted with the provisioning personnel at the System Program Management (SPM) Air Logistics Centers (ALCs). Points of contact at the ALCs were obtained from the SPO support equipment managers.

Problem Identification

Problems were identified in two primary ways. First, the SERD files provided a concise picture of the review process, at what point decisions were made and potential problem areas. Second, problems were identified through responses generated by the interviews with the support equipment experts.

Development of Solutions

The data collected from the samples of SERD files were analyzed to determine the average SERD processing time.

Dates of individual activities were collected to identify areas requiring management attention. A matrix was built to show the types of information provided by the participants in the review process. The matrix helped identify those decision elements which are critical to the design authorization decision and those decision elements which are important but could be made following approval of the SERD. The matrix was also used to determine if an expert system would be appropriate for determining support equipment requirements. An expert system is composed of two parts; a knowledge base, which contains the information which an expert uses to solve a problem and an inference engine, which is a generalized logical processor operating on the knowledge base to derive logical conclusions from the information stored in the knowledge base (3:4).

Chapter IV provides an overview of the current SERD Processing System in order to form a baseline for analyzing ways to improve the current system.

IV. The Current SERD Processing System

Introduction

This chapter will describe the current SERD processing system and the roles and responsibilities of the reviewers. The acquisition of support equipment requires the coordination and cooperation of many different Air Force commands. An understanding of this process is needed in order to analyze the utility of the current system.

Roles and Responsibilities

Headquarters United States Air Force (HQ USAF). Although HQ USAF is not normally involved in the SERD review process for a particular weapon system, they are responsible for formulating, establishing and maintaining Air Force policy on all aspects of support equipment acquisition (9:5-6).

Implementing Command. Although Air Force Systems Command (AFSC) is usually the implementing command, other Air Force agencies also acquire support equipment. The implementing command is responsible for prescribing, monitoring, reviewing and providing guidance on support equipment acquisition for each program and project in accordance with the policies in AFR 800-12 (9:6). The implementing command is also responsible for budgeting, funding, and acquiring all Peculiar Support Equipment (PSE) and identifying all support requirements. For the purposes

of this research project, AFSC is the implementing command. The specific support equipment acquisition responsibilities are delegated from HQ AFSC to the implementing product division which assigns this authority to a System Program Office (SPO). For this research project, this involves Aeronautical Systems Division (ASD) and the F-15, F-16 and B-1B SPOs. The program manager/director of the SPO normally delegates this responsibility to the Deputy Program Manager for Logistics (DPML) who assigns support equipment managers to accomplish the day to day tasks involved in support equipment acquisition (19:40). The SPO support equipment manager must coordinate these activities with the supporting and using commands to insure that the most cost effective support is being provided in sufficient time to support mission requirements (9:6).

Supporting Command. Air Force Logistics Command (AFLC), as the supporting command, is responsible for prescribing and monitoring guidance on the management of support equipment under its cognizance in accordance with the policies in AFR 800-12 (9:6). AFLC supports the implementing command in identifying and selecting support equipment and is responsible for budgeting, funding and acquiring all support equipment common to more than one weapon system (9:2).

Using Command. The using command supports AFSC and AFLC in the support equipment planning and acquisition process. They assist in determining the most cost effective

quantities, locations, mixes and need dates for the equipment required to support the using command's mission (9:7).

Air Training Command (ATC). ATC identifies support equipment requirements to support training requirements. They also review SERDs to determine if additional training will be needed to support new items of support equipment (9:7).

Air Force Operational Test and Evaluation Center (AFOTEC). This organization is involved in evaluating the effectiveness of the support equipment in accomplishing the task it was designed for. They also provide technical inputs and identify support equipment requirements needed to support the test programs (9:7).

Support Equipment Identification

Support equipment identification, selection and design is a detailed process concerned with providing cost effective support, on a life cycle cost basis, within the lead time required to ensure its availability with the system or equipment it will support. This identification process is accomplished using the Logistics Support Analysis (LSA) process and each support equipment requirement is documented on a Support Equipment Recommendation Data (SERD) which is submitted to the Air Force for review and approval. Before the contractor is authorized to submit the formal SERD, a preliminary SERD is reviewed by representatives from the

implementing, supporting and using commands in a Pre-SERD Review. The purpose of the Pre-SERD Review is to (10:18):

1. Examine the validity of the proposed support equipment requirement.
2. Determine the technical adequacy of the proposed item to do the job.
3. Establish the reasonableness of the proposed estimated price.
4. Ensure the proposed item is not more complex or expensive than its function requires.
5. Reject SERDs which identify items not permitted to be identified through the SERD process. An example is a standard hand tool.
6. Consider alternative sources such as local manufacture or local purchase for noncomplex items.
7. Validate quantities based on authorized requirements.
8. Tailor specifications for noncomplex items.
9. Identify administrative and clerical changes.
10. Determine SERDs requiring emergency processing due to criticality or need date and determine processing requirements.
11. Review requirements for technical orders and commercial manuals.
12. Evaluate the safety of the proposed item.

The SERD

The data item description DI-ILSS-80039 defines the required format of the SERD for all new programs. However, some contracts were established using the SERD format in DI-S-6176, which is still valid for those programs. Appendix B includes a copy of a SERD submitted by the General Dynamics

Fort Worth Division in support of the F-16 aircraft program. The SERD consists of two sections: Figure 1a and Figure 1b.

Figure 1a. This section of the SERD includes two parts. Part I, the Functional Analysis, describes the technical need for the item and the calibration requirements. Part II, the Recommended Solution, describes the support equipment the contractor is recommending to meet the functional requirement of the Part I. It identifies the actual manufacturer and part number of the particular support equipment item and it normally includes a preliminary diagram of the item being recommended. The diagram is not a detailed engineering drawing but is only meant to assist the Air Force in the initial review of the item (19:46).

Figure 1b. This section of the SERD includes availability, logistics support and reprocurment data for the equipment being recommended. It also includes the estimated development and production cost of the item. Some of the data in this section is provided by the government after SERD approval such as the National Stock Number (NSN) and the Source, Maintenance and Recoverability (SMR) code. The NSN includes the Federal Supply Class (FSC) which identifies which organization has management responsibility for the item. The NSN is also used for tracking the item in the Air Force inventory system. The SMR code identifies the source, maintenance concept and disposal and condemnation authority for the item. The Figure 1b also contains a great

deal of other information concerning the source of the item, the procurement lead time and quantity requirements by organization (19:46,47). More specific detail can be obtained by reviewing the Figure 1b included in Appendix B.

AFLC/AFSC Form 9 or SERL. Included with the SERD is an AFLC/AFSC Form 9, Support Equipment Recommendation Data (SERD) Evaluation/Notification, or a Support Equipment Requirement List (SERL). Although the AFLC/AFSC Form 9 is now the approved method of communicating support equipment requirements, some programs such as the B-1B and the F-16 programs use a program-unique form called a SERL. The Form 9/SERL is used to communicate such requirements as configuration management, design, testing, review and inspection, technical and provisioning data and other support equipment requirements. The more complex the support equipment item, the greater are the support equipment requirements in terms of specifications, design reviews, data, and other requirements (19:47).

The Form 9/SERL serves as the final approval document of the SERD review process. It is signed by the support equipment manager as well as authorized representatives from SPO engineering and logistics. It will identify whether the SERD is approved, disapproved, pending changes or it may direct the contractor to revise and resubmit the SERD. It is not unusual for a SERD to be revised and resubmitted a number of times before the Air Force approves the SERD (19:47).

Conducting Pre-SERD Reviews should reduce the number of revisions required by improving communication between the contractor and the Air Force. The Form 9/SERL is returned to the contractor on a Principal Contracting Officer (PCO) letter. However, SERD approval does not authorize the contractor to start developing the item but it may authorize the contractor to prepare a cost proposal for the item. Development effort does not begin until the cost proposal has been negotiated and a contract issued which normally takes at least another twelve months to complete. If the item is critical, the SPO contracting office may request permission to use an undefinitized contract which authorizes the contractor to start development before the negotiated contract has been issued. The Form 9/SERL also initiates a number of actions by the government including cataloging action, inclusion of the support equipment in the applicable table of allowance, facility planning and a variety of other functions (19:47).

The next section will examine the Air Force internal support equipment review cycle, often referred to as the SERD process. It will examine the SERD process beginning at the formal submittal of the SERD by the contractor through final approval by the Air Force.

The SERD Process

The SERD process refers to the internal Air Force review and approval process which the SERD goes through.

This section will describe the SERD process from the time the contractor submits a formal SERD until the Air Force returns the Form 9/SERL back to the contractor with disposition instructions.

As shown in Figure 2 of Appendix A, the SERD is normally distributed concurrently to the SPO, the System Program Manager (SPM) or End Article Item Management (EAIM) Air Logistics Center (ALC), the using command and any other organizations identified on the SERD data item (9:4).

SPO Review. The SPO has 75 days from date of receipt of the SERD from the contractor to review the SERD and provide comments back to the contractor on an AF Form 9 or SERL form. The 75 days allows an initial 60 day review while awaiting AFLC comments and 15 days following receipt of AFLC's recommendation to complete coordination within the SPO and forward the signed Form 9/SERL to the contractor. As identified in Figure 3 of Appendix A, the SERD is reviewed by numerous organizations within the SPO (12:10). The most common include the logistics, engineering, manufacturing, configuration, and contracting organizations.

SPO Logistics. The organization primarily responsible for SERD processing is the SPO logistics organization. In major weapon system SPOs, a division is often dedicated solely to support equipment acquisition. The major task of this organization is the overall responsibility for processing all SERDs, both GFE and CFE, maintaining complete SERD history files, providing recommendations

concerning price and intrinsic values, chairing support equipment reviews and tracking the status of all support equipment. This normally requires establishing a document control system to make sure that all required reviewing activities coordinate on the SERD. As the support equipment office of primary responsibility, they must insure that all conflicting recommendations have been resolved. Logistics normally establishes a SPO support equipment review committee to evaluate the item for technical and pricing adequacy and to evaluate the item for possible local manufacture or breakout to another source of supply (12:3).

SPO engineering. The SPO normally has a group of engineers dedicated to evaluating support equipment. They have a significant responsibility in the SERD process. They provide a technical assessment of the validity of the maintenance task identified in the Figure 1a, Part I of the SERD and assess the reasonableness of the proposed solution as identified in the Figure 1a, Part II of the SERD. They also designate the level of complexity of the item and determine the test and certification requirements based on the complexity of the item (19:57).

SPO Manufacturing/Quality. This organization often reviews SERDs to evaluate proposed manufacturing techniques and they also assist in evaluating cost proposals by assessing the proposed engineering hours required to manufacture the item.

SPO Configuration and Data Management. This organization assists in determining documentation and audit requirements for support equipment.

SPO Contracting. The contracting office officially forwards the AFLC/AFSC Form 9/SERL to the contractor on a letter signed by the Principle Contracting Officer (PCO). They are also responsible for obtaining timely cost proposals, evaluating proposed costs and chairing support equipment contract negotiations.

AFLC Review. The Air Logistics Center System Program Manager (SPM) or End Article Item Manager (EAIM), if the support equipment is supporting an item versus a weapon system, is the focal point for AFLC review of the SERD. The provisioning organization at the SPM ALC distributes the SERD to appropriate organizations for review and comment. AFR 800-12 allows 60 days for the provisioning activity to obtain all comments and forward a consolidated AFLC position to the SPO on an AFLC Form 603, Consolidated Support Equipment Recommendation Data Evaluation Transmittal. The AFSC/AFLC Supplement 1 to AFR 800-12 contains instructions on completing each block of the AFLC Form 603 (10:8). Once completed, it identifies logistics requirements for the piece of support equipment and provides the AFLC recommendation to the SPO concerning the item. However, before the AFLC Form 603 can be completed and forwarded to the SPO, the SPM ALC provisioning office must receive comments from the following AFLC organizations (10:6-9):

The AFLC Cataloging and Standardization Center (CASC). Cataloging personnel screen all part numbers and manufacturers' codes against existing stock listed items in the inventory using the Defense Integrated Data System (DIDS). If the item described in the SERD is not stocklisted, cataloging personnel assign the Federal Supply Class (FSC) and item name to ensure that new items entering the inventory are properly identified and classified with similar items. The FSC normally determines the Primary Inventory Control Activity (PICA) responsible for management, stockage and issue of the item (8:41-1).

Internal SPM ALC organizations reviewing the SERD include the engineering and reliability branch, the production management branch and the item management branch (19:57). This includes review by the item manager, weapon system equipment specialist and production planning experts. They review the item to determine if it is an appropriate solution to the test and repair requirement and they assign national stock numbers, recommend Source, Maintenance and Recoverability (SMR) codes and plan and budget for funds as required.

The ALC which has been designated as the Technical Repair Center (TRC) and the ALC with Item Management (IM) responsibility for the item must review the SERD if they are different from the SPM ALC. San Antonio Air Logistics Center (SA-ALC) has item management responsibility for a large

percentage of support equipment items so SERDs are frequently sent from the SPM ALC to SA-ALC for review and comment (10:7).

The Equipment Allowance Branch at the Warner-Robins Air Logistics Center (WR-ALC) reviews all SERDs except for items with nuclear ordinance implications which are sent to the Special Weapons Branch at the SA-ALC. WR-ALC establishes and has final approval on Basis of Issue (BOI) requirements. They also insure that approved items are included in the applicable Table of Allowance (TA) with authorized quantities. SA-ALC has similar responsibilities for nuclear ordinance items (10:7).

The Aerospace Guidance and Metrology Center (AGMC) reviews all SERDs for calibration requirements. They are the office of primary responsibility for the Calibration Measurement Requirements Summary (CMRS) which includes all system calibration requirements (10:7,9).

Once the SPO receives the AFLC Form 603 comments, they have 15 days to resolve any issues with AFLC, conduct a SERD Review Meeting, obtain SPO final coordination and signature and forward the signed AFSC/AFLC Form 9/SERL to the contractor. This overview shows that the SERD review process is a very complex system involving many players.

Chapter V will address the results of the research concerning the timeliness of this process and identify some of the problems concerning the current process.

V. Findings and Analysis

Phase I

This phase involved selecting and reviewing a sample of SERDs to determine if the 75-day review cycle identified in AFR 800-12 is being met. The steps involved were to identify the population, determine the sample size, select the SERDs to be included in the sample and review the SERD files to determine if the SERD review process is timely.

Identifying the population. The population consisted of the 2522 SERDs processed during the period 1 April 1987 through 31 March 1989 by the F-15, F-16 and B-1B System Program Offices (SPOs). SPO tracking systems and transmittal letters were used to identify those SERDs which had been processed during that time period. Excluded from the sample were SERDs which should have been processed during that time period but which were still in review. They were excluded because their total SERD processing time could not be determined. Table 4 shows the breakout by SPO of the 2522 SERDs.

Sample Size. The formula described in Chapter III was used to determine the sample size. Based on a population of 2522, a sample size of 334 was required to provide a 95 percent confidence level that the sample results were representative of the entire population. The sample size of 334 SERDs was then distributed among the SPOs based on their

share of the total population. Table 4 shows the sample size required for each SPO.

TABLE 4
SERDs Processed
1 Apr 1987 - 31 Mar 1989

Program	Number of SERDs	Percent of Population	Sample Size
F-15	615	24	80
F-16	720	29	97
B-1B	1187	47	157
Total	2522	100	334

SERD Selection. Once the sample size was determined, the next step was to randomly select the SERD files to be reviewed. A random number table was used to accomplish this selection process. A list of the SERDs reviewed, by weapon system is included in Appendix C.

Review Process. The SERD files and the SPO SERD tracking systems were used to determine the time required to process SERDS. All dates were transcribed into julian dates for ease in determining SERD review times. The SERD tracking systems for the F-15 and B-1B SPOs were used to determine the date of initial receipt of the SERD from the contractor. The F-16 SPO uses three different SERD tracking systems for the organizational, intermediate and depot level items which made it difficult to use for locating the sample SERDs.

Therefore, the researcher elected to extract the data from the official SERD files. In addition, the B-1B and F-15 SERD tracking systems did not track the date the AFLC Form 603 was received so the SERD files were also used to obtain that information. The F-15 SPO was the only SPO in the survey which date stamped the AFLC Form 603 upon receipt. For the B-1B and F-16 programs, the researcher annotated the latest date identified on the AFLC Form 603 or transmittal letter and added three days for mailing and distribution time between the SPM ALC and the SPO. All AFLC 603 forms were transmitted through routine mail distribution. The three days was the researcher's estimated average time to get an AFLC Form 603 from the ALC to the SPO. Although three days may be optimistic, the results show it was insignificant since the review time far exceeded the 60 days required by regulation. The sample consisted of randomly selected SERDs from the entire population of SERDs processed during the time period 1 April 1987 through 31 March 1989. However, there were two categories of SERDs which had to be excluded from the statistical analysis. Excluded, were those SERDs which did not have an AFLC Form 603 in the file and SERDs which took more than 365 days to process.

The purpose of the Phase I research was to ascertain whether the current system is processing SERDs within the 75 days required by regulation. This could not be realistically determined from the two categories identified above. For

example, the researcher contends that if a SERD takes in excess of one year to process, the problem is not caused by the current SERD processing system but is due to other extenuating circumstances outside the control of the current SERD processing system. To have included these SERDs in the analysis, would have greatly skewed the SERD processing times. The researcher found that this was not an infrequent occurrence. Table 5 shows the total number of SERD files reviewed versus those that were included in the Phase I analysis. A list of the SERDs reviewed is included in Appendix C.

TABLE 5
Categories of SERDs Reviewed

System	SERDs Included	SERDs Excluded No 603	+ 1 Yr	Total Reviewed
F-15	80	7	0	87
F-16	97	13	13	123
B-1B	157	8	70	235
Total	334	28	83	445

The B-1B SPO had a large number of depot SERDs which were not processed but were held one to two years while an issue concerning Technical Repair Center (TRC) assignments was resolved. HQ AFLC/MAW approves all TRC assignments which designates which ALC will repair the system being supported. Other SERDs took more than a year to process because of

technical issues which had to be resolved. Some of the SERD files did not contain an AFLC Form 603. This was common in actions initiated by the SPO. For example, when the SPO cancels a SERD because the item is no longer needed there is frequently no AFLC Form 603 in the file. As a result of these exclusions, the researcher had to review more files than originally planned in order to get a representative sample for Phase I.

Table 6 shows that SERD processing for the three systems reviewed significantly exceeded the standard 60-day AFLC review time and 75-day total review time required by Air Force regulation. The average processing time for the sample SERDs was 99.5 days for AFLC review, 76.1 days for SPO review and 175.6 days for total SERD review time. The SPO review time is actually the residual figure between the average total review days and the average ALC review days. It reflects the average minimum time that the SPO could have reviewed a SERD. In the worst case, the SPO could have worked on the SERD the entire review time.

TABLE 6
Average SERD Review Time
(Days)

Program	AFLC	SPO	Total
F-15	96.0	47.8	143.8
F-16	112.4	93.1	205.5
B-1B	90.2	87.3	177.5
Total	99.5	76.1	175.6

Table 7 compares the results of this research with the Air Force Audit results in Table 3 for the B-1B and F-15 SERDs. The F-16 program was not included in the Air Force Audit review.

TABLE 7
Comparison of Average SERD Processing Times

	Average SERD Processing Times					
	Audit Results			Thesis Results		
	ALC	SPO	Total	ALC	SPO	Total
F-15	140.3	46.6	186.9	96.0	47.8	143.8
F-16	N/A	N/A	N/A	112.4	93.1	205.5
B-1B	103.0	58.8	161.8	90.2	87.3	177.5

The researcher compared the SERD processing times for CFE versus GFE for the SERDs in the sample. Since the sample SERDs were randomly selected, there was no attempt to maintain an even distribution between CFE and GFE; however, the distribution turned out to be exactly equal with 167 CFE items and 167 GFE items. The B-1B SPO coded their breakout items as "E". The "E" coded items were considered as CFE for the purpose of this research since they are new items that are being developed to support the B-1B aircraft and were not previously in the Air Force inventory.

Breakout is a procurement method of acquiring equipment from a source other than from the prime contractor. Support equipment breakout is accomplished in two ways. One method

is to award a contract directly to the original manufacturer of the item and thus by-pass the prime contractor. The second more common method is to award contracts to small disadvantaged businesses, designated as 8A contractors, for the manufacture of non-complex items. Breakout allows the government to save the indirect cost and profits charged by the prime contractor to procure the item (19:77-78). In this study, breakout involves the second method of procuring non-complex support equipment items from an 8A contractor.

The researcher assumed that CFE items would take longer to process than GFE items that are already in the Air Force inventory. However, Table 8 shows that the average processing times for GFE and CFE SERDs is fairly consistent. The total average review time for GFE SERDs was 177.3 compared to 173.4 for CFE SERDs. The B-1B GFE SERDs took significantly longer than their CFE SERDs but this may have been caused by a Technical Repair Center (TRC) issue. The issue, which is still unresolved, involves the repair decision on a group of B-1B items which are common to the F-16 aircraft and which are currently being repaired at the Ogden Air Logistics Center (ALC). The B-1B SPM ALC wants to establish a second repair capability at the Oklahoma City ALC but the B-1B SPO has not budgeted to provide that capability. The issue is being reviewed by maintenance planning personnel at HQ AFLC/MAW.

TABLE 8

CFE Versus GFE SERD Review Time

	F-15		F-16		B-1B	
	CFE	GFE	CFE	GFE	CFE	GFE
#	53	27	48	49	66	91
ALC	95.9	96.0	103.1	121.5	104.6	79.8
SPO	47.8	47.9	101.5	84.9	67.3	101.7
TOTAL	143.7	143.9	204.6	206.4	171.9	181.5

Phase II

Phase II involved interviewing support equipment managers at the three SPOs (F-15, F-16 and B-1B), conducting telephone interviews with the three weapon system provisioning organizations responsible for processing the AFLC Forms 603 and reviewing the SERD files for additional information concerning the SERD review process and the decisions critical to design go ahead.

Prior to the interviews, a list of questions was developed to follow during the interviews. Appendix D includes the interview questions and Appendix E includes a list of the personnel interviewed. The questions were written to obtain a better understanding of the current system and the problems that today's support equipment manager faces in complying with Air Force policy and regulations. They were to help the researcher determine if the current system is adequate and to obtain recommendations for improvement from the support equipment experts.

Each interview was preceded by brief introductions and an explanation of the objectives of the study as well as the beneficial values of the research. It was stressed that the interviews and data collection were not meant to audit performance of a particular weapon system's SERD processing procedures but to provide a better understanding of the constraints and problems facing all support equipment managers. The results of the interviews are as follows:

Interviews with Support Equipment Managers

Question 1. Does your organization process SERDs within the 75 days required by regulation? If no, what are the primary constraints?

Answer 1. Each of the Support Equipment (SE) managers felt that, on the average, they were not meeting the 75-day requirement.

The F-15 and F-16 SE managers felt the biggest constraint was getting the AFLC Forms 603 returned from the SPM ALC in a timely manner. The B-1B SE manager felt it was caused more by SPO delays while awaiting additional information from the contractor or resolving technical issues. This is supported by the Table 6 statistics which indicate the B-1B SPO does receive AFLC Form 603 comments sooner than the F-15 and F-16 SPOs. However, it still takes an average of 90.2 days which far exceeds the 60 days required by regulation.

Question 2. Does your organization batch SERDs? Do you have different procedures for processing original SERDs versus simple administrative changes?

Answer 2. All SE managers indicated the SERDs are grouped according to which SERDs are ready for review by the SERD Review Board or for final coordination and approval. The SERD Review Boards meet once a month or on an as required basis but not more than once a month. The F-16 SPO holds their reviews the third Thursday of the month since their contracting office submits SERLs to the contractor the first of each month. There are times; however, when the coordination cycle is delayed and the SERDs are not submitted to the contractor until the following month. The researcher found this was a fairly common occurrence which obviously impacted the average SERD review time for the F-16. This is supported by the Table 6 findings which shows the average SERD review time for the F-16 SPO was significantly longer than for the F-15 and B-1B SPOs. The B-1B SPO was the only SPO that processed administrative changes differently. Simple administrative changes are processed without an AFLC Form 603 but telephone coordination is normally obtained. However, the B-1B SPM ALC organization indicated that they have no special procedures for processing administrative changes which explains why the B-1B files frequently showed receipt of the AFLC Form 603 after the SERL had been issued. The AFLC Form 603 was marked "no action required" and filed in the official SERD folder.

Question 3. Have the legislative changes concerning competition and spares and support equipment overpricing affected the support equipment acquisition process? What is the impact to SERD processing?

Answer 3. Everyone agreed that more attention is given to the estimated SERD price today which they felt was premature prior to receipt of the cost proposal. They also indicated that it is difficult, if not impossible, to process SERDs within 15 days of receipt of the AFLC Form 603 since a significant part of the SPO review cannot occur until the Form 603 has been received. The SERDs must then go before a SERD Review Board and they also require a higher level review and approval. The F-16 and B-1B SERDs are approved by the DPML while the F-15 SERDs are approved by the Program Director.

Question 4. Does your organization conduct Pre-SERD Reviews? What organizations normally participate? Do Pre-SERD Reviews improve the SERD review process?

Answer 4. The F-16 and B-1B SPOs conduct Pre-SERD Reviews. The F-15 SPO receives preliminary SERDs through the Engineering Change Proposal (ECP) process which serves as the Pre-SERD Review. Everyone agreed that reviewing preliminary SERDs and communicating with the contractor earlier helped reduce the number of revisions required. However, they did not feel that it had any major affect on reducing the time required to review and approve the official SERD when it was

submitted. The reviews are normally held at the contractor's facility and participants normally include SPO logistics and engineering, using command and ALC representatives. The F-16 SPO also include a technical order representative and depot reviews are held at the ALC where the item will be used. They felt that having the maintenance personnel in attendance was a significant benefit. A concern was expressed that recently equipment specialists have not been attending some of the Pre-SERD reviews. The SPM ALC representative signs for AFLC but they may not be familiar with the equipment. This lack of support was attributed to a shortage in TDY funds and manpower and the fact that when the Pre-SERD Review is held, many times the managing ALC has not yet been designated.

Question 5. What information do you receive from organizations outside the SPO that is needed to make a design decision?

Answer 5. The support equipment managers all related this question to the information they take off the AFLC Form 603 and use on the Form 9/SERL. Common responses were Source, Maintenance and Recoverability (SMR) codes, provisioning, technical, calibration and quantity requirements, as well as national stock numbers and part numbers. They felt that the first five were needed before SERD approval in order to obtain a valid contractor cost proposal.

Question 6. Does SERD approval authorize the contractor to start designing the item of support equipment?

Answer 6. No. SERD approval begins the proposal preparation phase but does not authorize the contractor to proceed with development of the support equipment. The F-15 program is slightly different in that the contractor prepares the cost proposal concurrent with the SERD approval process as part of the Engineering Change Proposal (ECP) process. Development does not begin until the contractor's proposal has been received, reviewed, negotiated and put on contract. This process normally takes 1 to 2 years after SERD approval. If the equipment is critically needed, the SPOs may request authorization to use Undefined Change Authorizations (UCAs) which permit the contractor to proceed with development before the contract has been issued. The B-1B manager indicated that because of the nature of the B-1B program, UCAs are used quite frequently for their equipment.

Question 7. What are the primary reasons that your organization disapproves SERDs?

Answer 7. All three SPOs indicated that they disapprove very few SERDs. They felt that the Pre-SERD Reviews help reduce the number of SERD disapproval actions required. Cancellations are more common than SERD disapprovals. SERDs are canceled if the item is no longer required. SERDs are also changed from CFE to GFE if the item manager can provide it.

Question 8. What method does your organization use for tracking SERDs?

Answer 8. All three SPOs use program-unique SERD tracking systems developed and maintained by consultant contractors. The F-15 and F-16 SE managers indicated they are planning to convert to the ASD SERD tracking system.

Question 9. Do you think the current SERD processing system is adequate? Are you able to meet the SE needs of the user? In your opinion how could it be improved?

Answer 9. All three support equipment managers agreed the current system could be improved. They said that it takes approximately five years to get a new piece of support equipment in the field, from the time it is first identified, which indicates the current system is not adequate. All three programs expressed concern that it takes too long to get AFLC comments and most of the SPO review cannot occur until they receive the AFLC Form 603. The support equipment managers all felt they were receiving good support from their SPM ALC. However, they were concerned that the SPM ALC was not getting adequate support from the other ALCs.

The next section will address the telephone interviews with support equipment provisioning personnel at Tinker AFB OK, Hill AFB UT and Robins AFB GA.

Interviews with SPM ALC Personnel

Question 1. Where do you distribute copies of the SERD when you receive them from the contractor?

Answer 1. All three ALCs described a similar system involving two distribution processes.

First Distribution:

- System Equipment Specialist (recommended SMR code)
- SPM Program Management (funding requirements)
- SPM Engineering Management (technical evaluation)
- HQ CASC (cataloging and federal supply class, nonstocklisted items only)
- HQ AFLC/MAW (B-1B depot SERDs only)

Second Distribution: (Occurs after comments from first distribution have been received)

Other ALCs (If not the SPM ALC):

- Item Management (national stock number/part number)
- Item Equipment Specialist (SMR code)
- Subsystem Technical Repair Center (TRC) (technical review)

- WR-ALC (Table of Allowance Monitor)
- Using Command
- ATC/Air Training Wings
- HQ AFLC/DSS (depot requirements)
- AGMC (calibration requirements)

Question 2. Do you meet the 60-day review cycle? If no, what are the major constraints?

Answer 2. All of the SPM ALCs indicated that it is difficult, if not impossible, to meet the 60-day review cycle. The biggest constraint identified by all three ALCs was obtaining comments from the other ALCs, especially from the San Antonio Air Logistics Center (SA-ALC). SA-ALC manages a high percentage of the support equipment items which means they process a lot more SERDs than the other ALCs. This results in backlogs and delays in providing SERD comments to the SPM ALC. In addition, delays occur when there is a conflict between ALCs over which ALC should have

management responsibility. Delays have also resulted from disputes over assigning national stock numbers to local manufactured items.

Question 3. What type of SERD tracking system do you use? Do you follow-up on SERDs that exceed the 60-day review cycle?

Answer 3. All three SPM organizations currently use manual SERD tracking systems. The F-15 and F-16 SPM offices are planning to automate their system in the near future. They all follow-up on delinquent SERDs on a weekly basis by sending suspense letters which they agreed were not extremely effective. This supports the 1988 Audit Report finding (23:8).

Question 4. Do you process SERDs in batches? Do the SERDs stay together throughout the review process?

Answer 4. When the SERDs are received from the contractor, they are separated by ALC, a control number is assigned and they are forwarded to the reviewing organization on an AFLC Form 726. Since one control number is assigned for the entire package of SERDs they normally remain together during the review process and are returned from the reviewing organization in their original batch.

Question 5. Do you use different procedures for processing original SERDS versus simple administrative changes?

Answer 5. All SERDs are processed the same regardless of the type of change. The only exception is that

nonstocklisted items are not sent to HQ CASC for screening action. This would indicate that the ALC review time for GFE items should be significantly shorter than for CFE since CASC is allowed 30 days to review CFE items. This assumption is not supported by the findings in Table 8 which shows that only the B-1B program experienced a shorter ALC review time for GFE than for CFE.

Question 6. How are the AFSC/AFLC Form 9/SERLs processed?

Answer 6. All three SPM ALC organizations indicated that they forward a copy of the signed Form 9/SERL to all organizations which originally reviewed the SERD and provided comments.

Question 7. Does the SPO always forward AFLC requirements to the contractor?

Answer 7. The SPM ALC personnel felt that the SPO normally supported AFLC requirements. However, a concern was expressed that sometimes the SPO approves items without AFLC input.

Question 8. Do you have any suggestions for improving the current system?

Answer 8. The F-15 SPM organization indicated that they had recently established a SERD Team which they feel has significantly improved their process. They now monitor SERDs more closely and review AFLC 603 comments for accuracy. They felt that in the past, erroneous information was sometimes submitted to the SPO.

All three managers agreed there is a need for better procedures on how SERDs should be handled and clearer policy on management responsibilities. They recommended that training be provided for everyone involved in processing SERDs. They felt that it was important that each organization fully understand the requirements of the other reviewing organizations and that they fully understand the cost impact of a simple error on the Form 9/SERL.

Another recommendation was to revise the AFLC Form 603. They stated that the concurrence block is confusing because it is unclear whether they're concurring/nonconcurring with the requirement for the item or the SERD as written.

In addition to the interviews identified above, the researcher also contacted the HQ AFLC/DSS office to obtain information concerning their role in the SERD review process. This office screens all depot SERDs to determine if there is existing depot equipment which will meet the requirements of the SERD thus reducing the proliferation of depot equipment. They receive copies of all SERDs even though they are only concerned with depot SERDs. SERDs for other than depot equipment are returned to the SPM ALC without comments. However, they are held until the entire batch of SERDs has been reviewed (18).

In addition to the interviews, the SERD files were reviewed to obtain information concerning delays in the review process.

Results of Reviewing SERD Files

During the Phase I process of reviewing the SERD files to determine the timeliness of SERD processing, the researcher was also reviewing the documentation in the file. The researcher developed a matrix to identify consistencies among programs and items and to identify areas where changes could improve the current SERD processing system. During this research, the following problems or potential problems were identified.

The SPOs frequently send suspense letters or messages to the SPM ALC when the AFLC Form 603 comments are late. There were also suspense letters to the SPO from the SPM ALC requesting status on SERDs for which the AFLC/AFSC Form 9 was past due. Data in the files indicated that using command comments are normally received prior to AFLC comments and are not impacting the SERD review process.

The AFLC Form 603 did not contain a consolidated AFLC position concerning concurrence or nonconcurrence to the contractor's recommended item. The comments block contained concurrence by one ALC and nonconcurrence by another ALC but there was no consolidated AFLC position.

The dates on the AFLC Forms 603 indicated that comments from other ALCs were frequently the last comments received which indicates that late comments from other ALCs is a significant problem. This supports concerns expressed during the interviews.

SMR code changes were common. The item equipment specialist frequently changed the SMR code recommended by the system equipment specialist which had no real impact but which supports the concern that SMR code assignments are extremely subjective and based on the experience level of the equipment specialist. However, there is an impact when the SMR code is changed on an item from one SERD revision to the next. While some were minor changes, others were major; changing the item from a nonreparable to a reparable item and vice versa. As a minimum, an SMR code change drives a change to the technical orders which is very costly. In some cases, the SPO personnel caught the change, contacted the ALC and did not forward it to the contractor. In other cases, the change was forwarded to the contractor on the Form 9/SERL with no annotation in the file as to whether the ALC had been contacted to verify the validity of the change.

The AFLC Form 603 frequently requested provisioning data, support equipment illustrations and/or calibration data for Government Furnished Equipment. Since the prime contractor does not provide this equipment, there would be no way for him to provide this data. There were also SERD items coded nonreparable for which the government requested provisioning data. There were instances where the SPO changed errors on the AFLC Form 603 but there were other instances where they did not catch obvious errors which were then forwarded to the contractor. The researcher was unable to determine from the data available, whether the Government

is being charged for these erroneous data requests. There were also instances where the SPO did not include valid AFLC requirements on the AFSC/AFLC Form 9/SERL.

Some of the SERD files showed considerable time lapse between receipt of AFLC comments and SERD approval. This supports the interview comment that 15 days is not an adequate amount of time for SPO review after receipt of the AFLC Form 603 comments. The F-15 and F-16 SERDs frequently showed up to a month time lapse between SERD approval at the SERD Review and SPO submittal of the AFSC/AFLC Form 9/SERL to the contractor. This indicates delays are occurring between the time the SERD is approved and the time it is officially sent to the contractor. The B-1B SERDs were normally distributed within three days after SERL signature.

The next chapter will draw conclusions and make recommendations based on the information collected during the interviews and while reviewing the SERD files.

VI. Conclusions and Recommendations

Introduction

This chapter will draw conclusions from the findings by answering the investigative questions listed in Chapter I. The researcher will then make recommendations, based on these conclusions, for improving the current SERD processing system.

Phase I answers investigative questions number one and two which address the average length of time it takes to process SERDs.

Investigative Question Number One

The first objective was to identify "Are SERDs being reviewed and approved within the required 75-day review cycle?"

This research supports earlier audit findings that SERDs are not being processed within the required time frame.

Investigative Question Number Two

The second objective was to determine, "What is the average SERD review time and where are the delays occurring?"

This research shows that the average time to review and approve SERDs is 175.6 days versus the 75 days identified in AFSC/AFLC Supplement 1 to AFR 800-12. This is an improvement over the findings in the 1988 Audit Report which found an average SERD processing time of 199 days for the five systems

included in that audit report. This result difference may be attributed to the difference in sample size and the different method used to select the sample SERDs. The auditors used a much smaller sample and they used a judgmental selection process.

The research shows that AFLC comments are not being processed within the 60 days required by the regulation but are instead taking an average 99.5 days. The results also show that it takes the SPO an average 76.1 days to process the AFSC/AFLC Form 9/SERL after receipt of the AFLC Form 603 comments rather than the 15 days required by regulation.

Therefore, Phase I of this study concludes that SERDs are not being processed within the time requirements identified in the regulation and that the delays are occurring during both the AFLC and AFSC review cycles.

Phase II. This second phase involved interviewing support equipment managers at the three SPOs and conducting telephone interviews with the provisioning personnel from the three SPM ALCs. The support equipment managers are responsible for reviewing the SERD, collecting SERD comments, reconciling any differences and forwarding an Air Force decision to the contractor. The SPM ALC provisioning personnel are responsible for distributing copies of the SERD to appropriate organizations, collecting AFLC and using command comments and forwarding an AFLC position to the SPO.

Phase II also included reviewing the official SERD files for the sample SERDs to gain a better understanding of where

the delays are occurring and to determine where changes could be made to improve the current SERD review process.

Phase II answers investigative questions number three and four which address the constraints in the current SERD processing system and recommendations for streamlining the current system.

Investigative Question Number Three

The third objective was to identify, "What constraints do the support equipment manager perceive as significant?" The conclusion drawn from this data is that the current SERD review process as defined in Air Force regulation cannot be routinely accomplished within the 75 days allowed. There are just too many players involved and the action of one player is normally contingent upon the completed action of another.

Investigative Question Number Four

The final objective was to determine, "Can the current SERD process be streamlined to permit a more timely decision while insuring that Air Force support equipment objectives are met?"

The research shows that the current SERD review system is not working. Changes need to be made if we want to support our weapon systems in the future. We cannot continue to routinely consume 176 days to review and approve support requirements. Realistically, we cannot identify the requirements earlier because of the risk that the weapon

system design will change. To extend the 75 days would only result in lengthening the current four to five years required to get a new piece of support equipment in the field. The fact that it takes as long to review and approve an existing GFE item that is already in the Air Force inventory as it does to review and approve the development of a new CFE item indicates that the SERD review process is too cumbersome and should be streamlined.

Recommendations

This section will address problems which were identified during the research and make recommendations for improving each area.

Automated SERD Processing. Based on the level of interest in the modernized AFEMS, the researcher assumes that AFEMS will eventually have the capability to track and transmit digitized SERDs. Once this capability is available, the amount of time required to review SERDs should be significantly reduced. However, AFEMS will not cure all of the problems in the current SERD review system as there are still other procedures which could be improved. Actually, implementing AFEMS for SERD processing will give the Air Force a good opportunity to make other major changes to the current SERD review system.

Revising the current process. The current system involves a large number of individuals reviewing the SERD before development of the item can begin. Some of these

reviewers are critical to the review process to insure that the Air Force only buys that equipment which is necessary and does not proliferate an already excessive inventory. Other reviewers are really only required if and when the item is approved for Air Force use. The researcher believes that the modernized AFEMS will provide the capability to implement a two step review process. The SERD should initially be reviewed only by those organizations that have an impact on the decision to approve or disapprove the item. Step two would then involve review of the approved SERD by the organizations responsible for getting the item loaded into the AFLC systems and would include such tasks as assigning national stock numbers, inputting into the Table of Allowance, etc. This two step process should be easy to implement and should significantly reduce the time required to field a new piece of support equipment.

Prior to AFEMS. The capability to transmit SERDs electronically will not be available before July 1993 and possibly even later. Until then, something needs to be done to improve the current system. One of the major problems appears to be the backlog occurring at the San Antonio Air Logistics Center (SA-ALC) where the majority of support equipment is managed. The researcher recommends establishing a cadre of equipment specialists at the ALD to review all ASD SERDs. Since ASD manages a high percentage of the acquisition programs, this would also improve the response

time on programs from the other product divisions by reducing the workload at SA-ALC.

AFLC Form 603 Comments. The research shows that there is inconsistency in the comments being provided on the AFLC 603 Forms which indicates lack of training or that the decisions are being made very subjectively. For example, the same SERD may be reviewed by different equipment specialists, with different backgrounds and experience, resulting in different and conflicting decisions. The researcher recommends AFLC develop an expert system to assist their managers in reviewing support equipment requirements and in preparing their responses on the AFLC Form 603. The expert system developed for assisting inventory managers has successfully improved the spares requirements process (3:8). The researcher believes an expert system could also improve the support equipment requirements process by capturing the knowledge of the most experienced equipment specialists and providing a more analytical method of determining support equipment requirements.

SERD Processing Training. It appears that some of the errors are occurring as the direct result of inexperienced or untrained personnel who do not understand the impact of incorrectly annotating the AFLC Form 603 or AFSC/AFLC Form 9/SERL. For example, incorrectly annotating the requirement for calibration and provisioning data can result in significant unnecessary costs or supportability problems later in the program. The researcher recommends the ALD or

AFOSEM organization develop and provide a detailed training course specifically designed for those individuals involved in the SERD review process.

SPO Responses to the Contractor. The researcher recommends the SPOs review their current procedures for forwarding the signed AFSC/AFLC Form 9/SERL back to the contractor to insure they provide timely responses. For example, the F-15 and F-16 SPOs are taking up to a month to forward the Form 9/SERL back to the contractor after it has been through the entire review process. The researcher recommends the SPOs develop automated contractual procedures to electronically transmit the SPO comments to the contractor as they are approved versus using the current manual procedures of submitting in batches.

Other Recommendations. Additional or clearer policy is needed in areas where there is disagreement over management roles and responsibilities. Areas currently needing clarity include:

1. Procedures for stocklisting local manufactured items and including them in the appropriate Table of Allowance.
2. Better defined policy in the area of support equipment item management. This is especially needed in the area of test packages for automatic test equipment.
3. Earlier decisions concerning depot activations. The depot concept should be defined early to insure that the planning, budgeting and identification process supports the correct depot concept and to preclude issues surfacing after the SERD is submitted for review.

Areas of Further Study

The researcher recommends two areas of further study. First, this research did not address the process occurring after SERD approval but prior to contract award. The support equipment managers all mentioned that the time required to get support equipment on contract after SERD approval is excessive often taking up to two years to accomplish. A research effort could be conducted to examine this portion of the support equipment acquisition process and identify ways to improve it.

A second recommendation would be for further research in the area of depot planning. It is apparent that the official depot support concept must be defined and agreed to very early in the program to preclude support equipment delays later in the program. A research effort could be conducted to examine the present depot planning process and recommendations should be briefed to the appropriate staff for implementation.

Appendix A: SERD Review Flow Charts

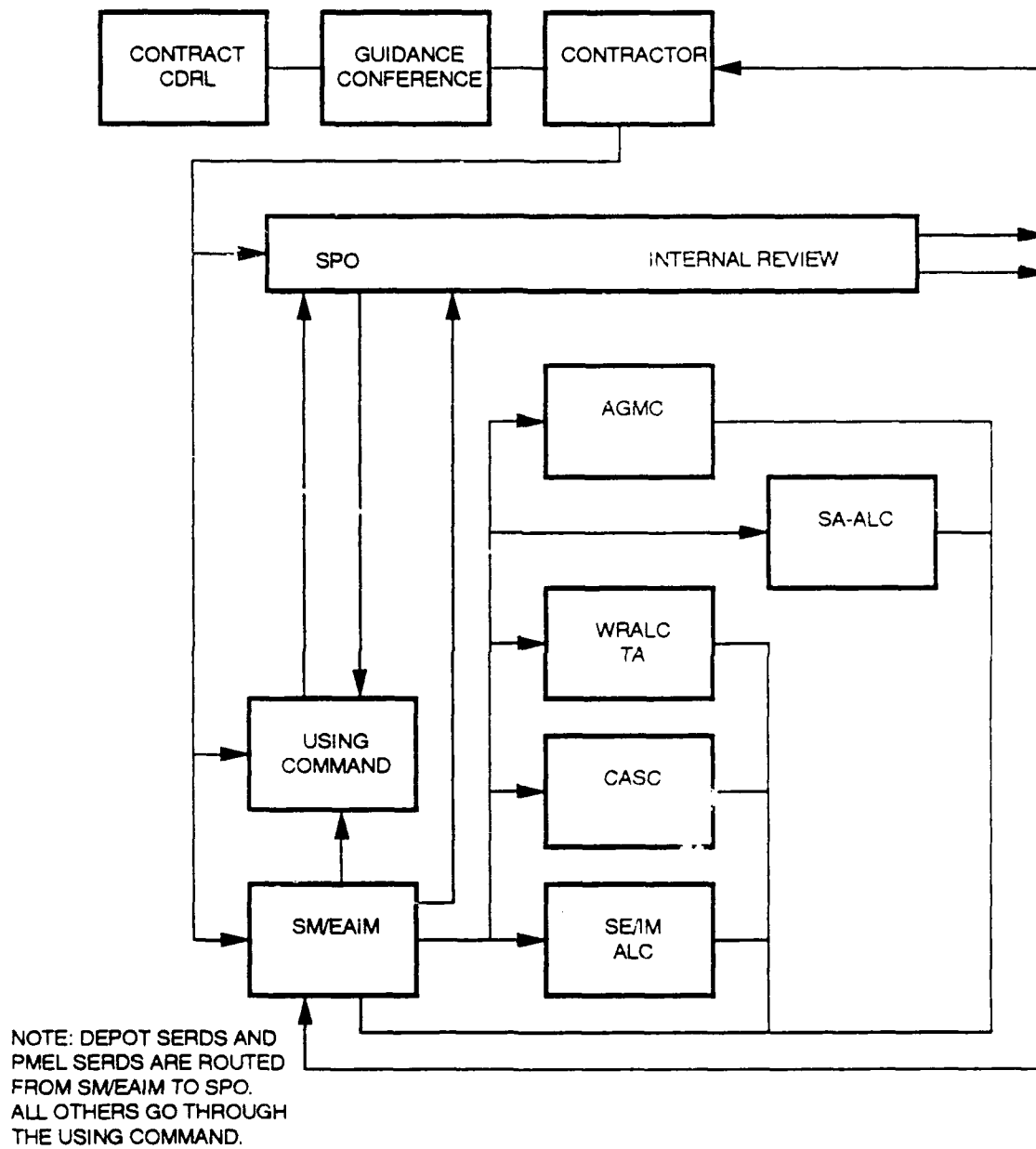


Figure 2. SERD Approval Cycle (9:4)

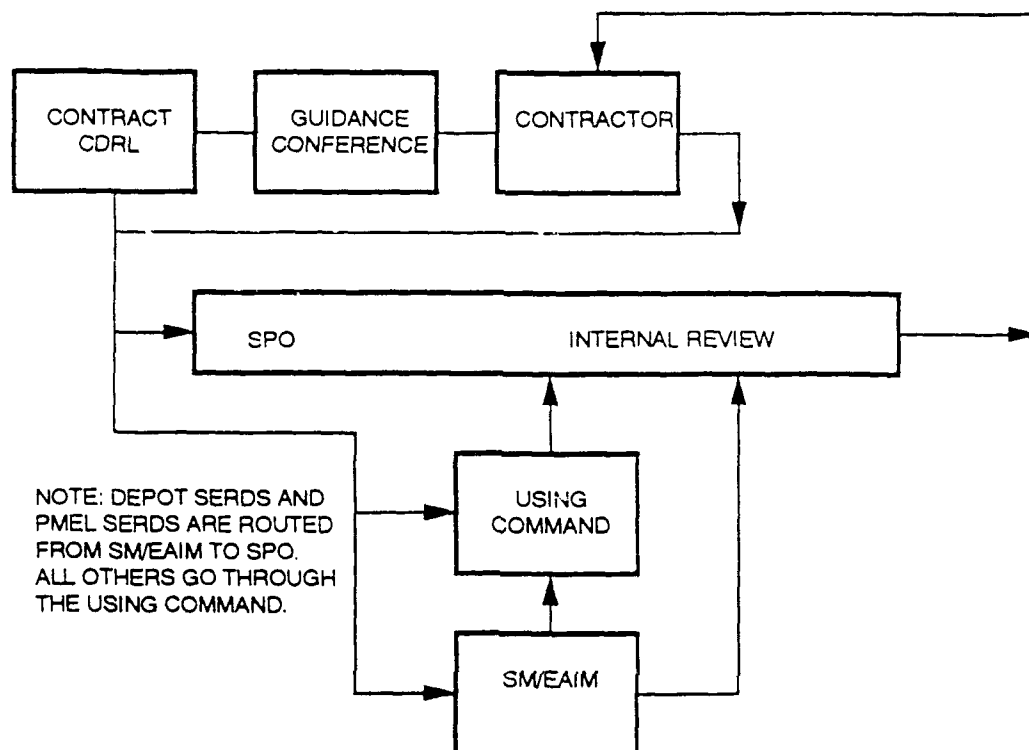


Figure 3. Abbreviated SERD Approval Cycle (9:5)

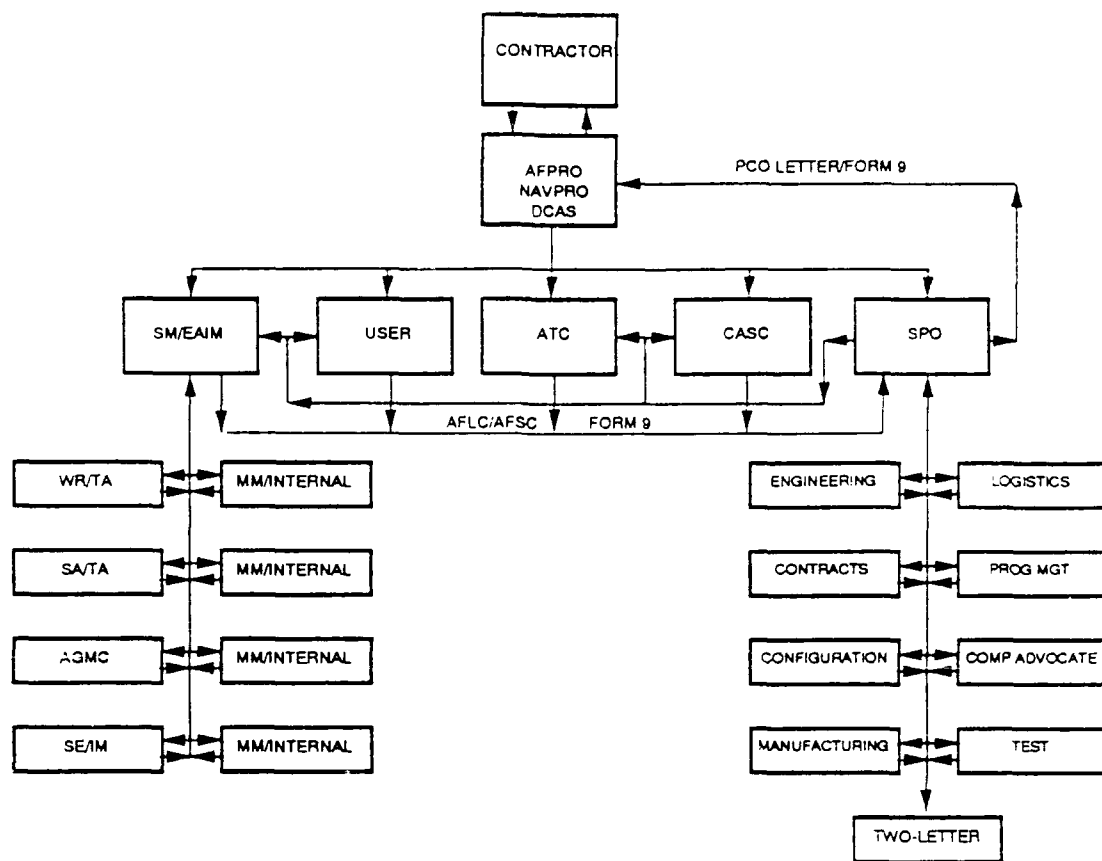


Figure 4. ASD SERD Approval Cycle (12:10)

Appendix B: Sample SERD

GENERAL DYNAMICS
Fort Worth Division

DEPOT

SUPPORT EQUIPMENT
RECOMMENDATION DATA (SERD)

DOCUMENT NO. 16PP011
CONTRACTOR General Dynamics
CONTRACT NO. F33657-82-C-2034
END ARTICLE IDZNT F-16A/B/C/D
FIG 1 PAGE NO. 1
REVISION NO. C
DATE 22 DECEMBER 1987

PART I - FUNCTIONAL ANALYSIS

During depot level maintenance of the governor assembly, Sundstrand P/N 700474E, (sub-assembly of the F-16A/B Constant Speed Drive (CSD), P/Ns 727429, 727429A, B, C, D, or E and the F-16C/D CSD, P/Ns 734556 or 734556A) it is necessary to remove ball bearing P/N 54322 from the governor stem of the stem and sleeve matched set, P/N 702405A, without damaging match-machined surfaces of the governor stem.

MFTBF for F-16A/B CSD is predicted to be 1500 hours.
MFTBF for F-16C/D CSD is predicted to be 2500 hours.

PART II - RECOMMENDED SOLUTION

It is recommended that an assembly tool, Sundstrand P/N AKS28601, or equivalent, NSN 5120-01-060-2824, be used to meet requirements of PART I.

A. Technical

The tool consists of a base and two split bushings. The base supports both split bushings during removal of inner and outer races stationary while the governor stem is pressed from the races. The split bushing used during removal of the outer race fits under the race flange and around the small outside diameter of bearing. The split bushing used to remove inner race has a 0.436 inch inside diameter 0.047 inch thick that fits into bearing groove on the inner race.

B. Applicable Specification

None.

C. Applicable Tests

None.

D. Associate Equipment

None.

(continued on page 2)

ITEM NO.	ITEM NAME
42853	ASSEMBLY TOOL (ECP 1263/1268)

Figure 1a

NO 0215 021

ANALYSIS OF THE SUPPORT EQUIPMENT REVIEW AND

APPROVAL PROCESS(U) AIR FORCE INST OF TECH

WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.

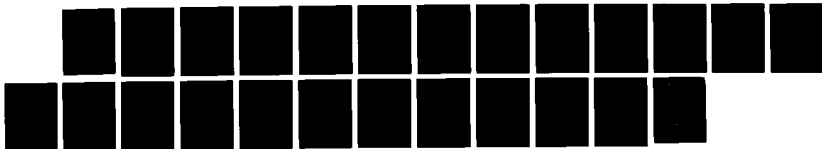
J F BASSETT

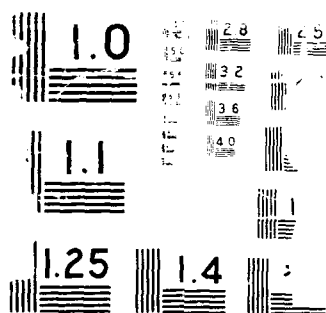
UNCLASSIFIED

SEP 89 AFIT/GLM/LSM/895-1

F/G 15/5

NL





GENERAL DYNAMICS
Fort Worth Division

DEPOT

SUPPORT EQUIPMENT
RECOMMENDATION DATA (SERD)

DOCUMENT NO. 16PR011
CONTRACTOR General Dynamics
CONTRACT NO. F33657-82-C-2034
END ARTICLE IDENT F-16A/B/C/D
FIG 1 PAGE NO. 2
REVISION NO. C
DATE 22 DECEMBER 1987

PART II - RECOMMENDED SOLUTION (continued)

E. Container Requirement

None.

F. Revision Notice

Original: This item was covered in preliminary SERD/SERL review at Oklahoma City ALC November 16-17, 1977.

Revision A: Revised to add F-16 C/D requirements (P/N 734556).

Preliminary SERD and SERL were reviewed for technical concurrence on 26 March 1985 at OC-ALC (Reference 16PR691, Supplement 145).

Revision B: Revised to add new part numbers (734556A and 734556B) created by ECPs 1263 and 1268.

Revision C: Revise to remove non-existing part number (734556B), and clarify A/C usage in Fig. 1a PART I per informal SPO direction during meeting held at GD Ft. Worth 4/27/87.

ITEM NO.	ITEM NAME
42853	ASSEMBLY TOOL (ECP 1263/1268)

Figure 1a

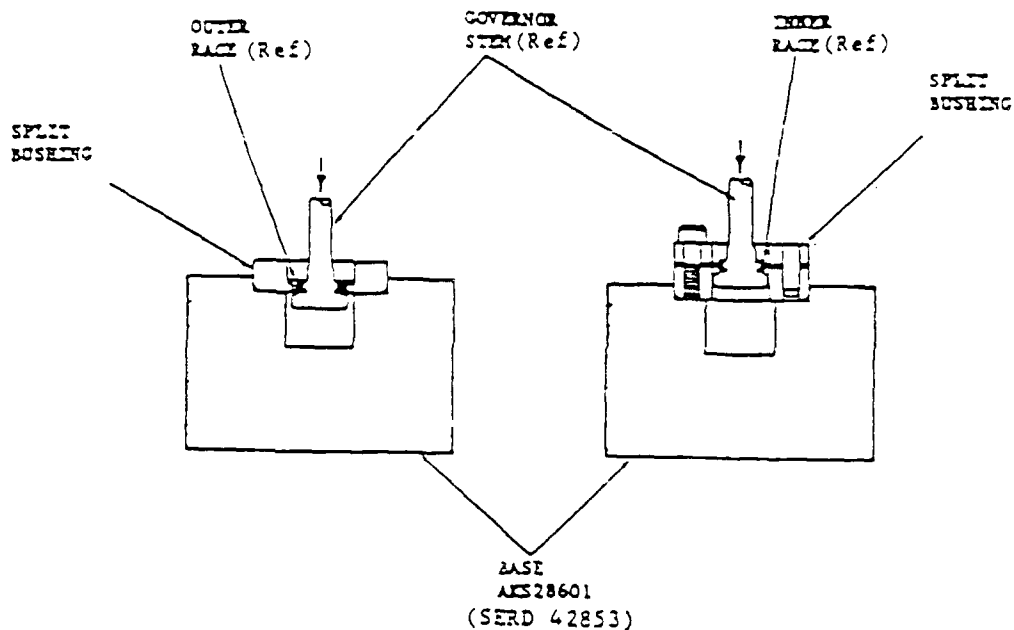
GENERAL DYNAMICS
Fort Worth Division

DEPOT

SUPPORT EQUIPMENT
RECOMMENDATION DATA (SERD)

DOCUMENT NO. 16PRO11
CONTRACTOR General Dynamics
CONTRACT NO. F33657-82-C-2034
END ARTICLE IDENT F-16A/B/C/D
FIG 1 PAGE NO. 3
REVISION NO. C
DATE 22 DECEMBER 1987

MATERIAL: STEEL
SIZE: BASE - APPROXIMATELY 2 INCHES BY 3 INCHES DIAMETER
SPLIT BUSHING: APPROXIMATELY 1 INCH BY 1.5 INCHES DIAMETER
SPLIT BUSHING: APPROXIMATELY 0.672 INCH BY 1.5 INCHES DIAMETER
WEIGHT: APPROXIMATELY 3 POUNDS
FINISH: BLACK OXIDE



ITEM NO.	ITEM NAME
42853	ASSEMBLY TOOL (ECP 1263/1268)

Figure 1a

FORM 210A-100

DATE: 22 DECEMBER 1987

DOC. NO. 16FR011

PAGE NO. 4

SUPPORT EQUIPMENT RECOMMENDATION DATA (SERID)

CONTRACT NO. F33657-82-C-2034

QUANTITY C

CROSS INDEX

END ARTICLE

F-16 A/B/C/D

CONTRACTOR General Dynamics

REV. NO. C

NAME

ASSEMBLY TOOL (ECP 1263/1268)

CAL

7

EMITICAL

7

1 ITEM NO.	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
RESPONSIBLE AGENCY	WORLD DESCRIPTION	AGE INDEX	NATIONAL STOCK NO.	EST. DATE	EST. PROD. LEAD TIME	DATE OF APPROVAL	DATE REQ'D.	DEV. COST	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
42853	CSD	GG-6	5120 01	060 2824	99167 AKS28601	****																		
	GFE																							

REMARKS: **** Or Equivalent

(a)

F-16A - 7 & on

F-16B - 3 & on

F-16C/D 1 & on

Prime SHR Code PEFFU Unit Price

Prod. Lead Time Plus Administration:

Item Manager Symbol Ext.

Operational Recommended Quantity Factor - 2

Number to be determined by Program Authority Document.

OD Engineer J. R. Schreiner

Ext. 33782

19	20	21	22	23	24
USE	Orgn	Inter	FM	ATC	TOTAL
NO	0	0	2	0	
h/i					
TOTAL					

Fig. 1b

SE REQUIREMENT LIST

Contractor GENERAL DYNAMICS

Contract No. F13657-82-C-2034

End Article Ident F16A/B/C/D

Revision No. 1a C 1b C

Date 22 DECEMBER 1982

GFL Yes Page No.

P/W AWC28601 or equivalent MSN 5120-01-060-2824

LCC COMPLETED SUMMARY FORWARDED No MIL HDBK 300 SCREENING ACCOMPLISHED Yes

AF REQUIRED	GO RECOMMENDED
1. _____	1. _____
2. _____	2. _____
3. _____	3. <u>X</u>
4. _____	4. _____
5. _____	5. _____
6. _____	6. _____
6A. _____	6A. _____
7. _____	7. _____
8. _____	8. _____
9. _____	9. _____
10. _____	10. _____
11. _____	11. _____
12. _____	12. _____
13. _____	13. _____
14. _____	14. _____
15. _____	15. _____
16. _____	16. _____
17. _____	17. _____
18. _____	18. _____
19. _____	19. _____
20. _____	20. _____
21. _____	21. _____
22. _____	22. _____
23. _____	23. <u>X</u>
24. _____	24. _____

REMARKS

- CONFIGURATION MANAGEMENT
 - 1. PRIME ITEM (Denotes CI Spec Requirement)
 - 2. CRITICAL ITEM (Denotes CI Spec Requirement)
 - 3. NONCOMPLEX ITEM
 - 4. STATUS ACCOUNTING REQUIRED
- DESIGN
 - 5. GENERAL DYNAMICS SPEC 16PS003
 - 6. PER DEVIATION AS CITED IN SERD OR CI SPEC
 - 6A. PARTS CONTROL IN ACCORDANCE WITH 16PP136A
- TESTING
 - 7. SYSTEM COMPATIBILITY TESTING
 - 8. FIRST ARTICLE TESTING AS CITED IN CI SPEC
 - 9. FIRST ARTICLE TEST PLANS/PROCEDURES (Items 1&2 Above)
 - 10. FIRST ARTICLE TEST REPORT (Items 1 & 2 Above)
 - 11. COMPATIBILITY TEST PROCEDURES (Items 1&2 Above)
 - 12. COMPATIBILITY TEST REPORT
- REVIEWS/INSPECTIONS
 - 13. PRELIMINARY DESIGN REVIEW (PDR)
 - 14. CRITICAL DESIGN REVIEW (CDR)
 - 15. CONFIGURATION AUDITS
 - 16. OTHER, SEE "REMARKS" BELOW
- SE DATA
 - 17. SE ILLUSTRATIONS
 - 18. CALIBRATION REQUIREMENT SUMMARY
 - 19. ENGINEERING DATA (Reprocurement)
- PROVISIONING DATA (Information Only)
 - 20. CTRAL/CFE NOTICES (Technical Orders) (For Tech Pubs)
 - 21. RECOVERABLE ITEM BREAKDOWN (RIB) (For Spares Use)
- OTHER
 - 22. ATE SOFTWARE
 - 23. MULTINATIONAL REQUIREMENT
 - 24. OPTIMUM REPAIR LEVEL ANALYSIS (Record "ORLA" Only Required)

LEGEND: X - Original/Basic SERD Requirements R - Requirements Applicable To This Revision/Change * - And/Or 'Note ()' - See Remarks <input type="checkbox"/> RECORD CHANGE ONLY	NAME ENGINEERING- YPEL	DATE
	NAME LOGISTICS- YPL	DATE

ITEM NO. 42853	ITEM NAME ASSEMBLY TOOL (COP 1253/1268)	Sub # 1937
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Appendix C: SERD Analysis Data

Below are the data inputs for the F-15, F-16 and B-1B SERDs which were used to calculate the ALC, SPO and total average processing times. The sample SERDs are identified by SERD number and all dates have been transcribed into Julian dates to facilitate the calculation process. Column five identifies the total days processing time, per SERD, for ALC review and comment while column eight identifies the total SERD review time (in days) for each SERD in the sample. The SPO review time was calculated by subtracting column five from column eight.

F-15 SERD STATUS

SERD NUMBER	SERD DATE	603 DUE	603 RCV'D	603 DAYS	FORM 9 DUE	FORM 9 SENT	TOTAL DAYS
8143C/B	350	410	397	47	425	463	113
3919C/O	167	227	211	44	242	244	77
0954C/B	308	368	389	81	383	460	152
1188C/A	75	135	132	57	150	168	93
2470G/A	75	135	122	47	150	168	93
3331G/C	75	135	132	57	150	168	93
3445G/A	28	88	103	75	103	188	160
3968G/O	75	135	132	57	150	248	173
3984G/O	175	235	236	61	250	265	90
8001C/A	75	135	132	57	150	149	74
8005C/A	75	135	132	57	150	149	74
8020C/O	39	129	206	137	144	278	209
8031C/A	69	129	284	215	144	385	316
8039C/A	77	137	132	55	152	149	72
8042G/A	75	135	132	57	150	149	74
8047C/O	75	135	163	88	150	244	169
8051C/O	152	212	195	43	227	294	142
8054C/O	205	265	300	95	280	320	115
8086C/O	139	199	223	84	214	244	105
8091C/O	334	394	449	115	409	600	266
8102C/O	139	199	181	42	214	244	105
8106C/O	315	375	356	41	390	543	228

F-15 SERD STATUS CONTINUED

SERD NUMBER	SERD DATE	603 DUE	603 RCV'D	603 DAYS	FORM 9 DUE	FORM 9 SENT	TOTAL DAYS
8110C/O	315	375	398	83	390	466	151
8117C/O	315	375	398	63	390	476	161
8124C/O	153	213	275	122	228	338	185
8054C/A	30	90	61	31	105	95	65
8091C/A	327	387	409	82	402	441	114
8143C/B	350	410	397	47	425	463	113
8160C/O	204	264	426	222	279	463	259
8173C/O	221	281	326	105	296	397	176
8183C/A	350	410	454	104	425	480	130
8191C/O	218	278	326	108	293	397	179
8194C/O	218	278	326	108	293	397	179
8203C/O	4	64	82	78	79	109	105
8204C/A	221	281	375	154	296	405	184
8209C/O	221	281	375	154	296	405	184
8221C/O	60	120	194	134	135	224	164
8222G/O	75	135	118	43	150	168	93
8225G/O	34	94	76	42	109	100	66
8232C/O	272	332	363	91	347	405	133
8241C/O	222	282	353	131	297	385	163
8249C/O	364	424	413	49	439	463	99
8254C/O	273	333	363	90	348	405	132
8258C/O	235	295	363	128	310	405	170
8269C/O	235	295	313	78	310	371	136
8273C/A	152	212	176	24	227	210	58
8286C/O	288	348	389	101	363	424	136
8287C/O	288	348	389	101	363	424	136
8291G/O	310	370	390	80	385	496	186
8302C/O	308	368	389	81	383	424	116
8308C/O	300	360	405	105	375	441	141
8315C/O	312	372	409	97	387	441	129
8335G/O	20	80	236	216	95	265	245
8344C/O	28	88	236	208	103	265	237
8350C/O	28	88	166	138	103	188	160
8356C/O	28	88	145	117	103	162	134
8359C/O	28	88	153	125	103	188	160
8366C/O	109	169	213	104	184	235	126
8370C/O	109	169	213	104	184	235	126
8379G/O	105	165	266	161	180	320	215
8381G/O	105	165	287	182	180	327	222
8385G/O	109	169	216	107	184	265	156
8386G/O	105	165	287	182	180	332	227
8404G/A	221	281	322	101	296	377	156
8414G/A	113	173	206	93	188	278	165
8421C/O	339	399	456	117	414	499	160

F-15 SERD STATUS CONTINUED

SERD NUMBER	SERD DATE	DUE	RCV'D	DAYS	DUE	SENT	DAYS
8433C/O	354	414	410	56	429	442	88
8442C/O	354	414	411	57	429	442	88
8471G/A	113	173	206	93	188	278	165
8473G/A	281	341	347	66	356	377	96
8503G/A	123	183	284	161	198	320	197
8504G/A	123	183	214	91	198	224	101
8516G/O	123	183	214	89	200	265	140
8520G/O	90	150	122	32	165	172	82
8527G/O	123	183	187	64	198	230	107
8534G/O	147	207	236	89	222	278	131
8537G/O	147	207	284	137	222	335	188
9926G/A	113	173	213	100	188	224	111
9976C/A	84	144	194	110	159	214	130
9992G/A	35	95	145	110	110	188	153
Average Review Time (Days):				96.0	143.8		

F-16 SERD STATUS

SERD NUMBER	SERD DATE	603 DUE	603 RCV'D	603 DAYS	FORM 9 DUE	FORM 9 SENT	TOTAL DAYS
90534C/CD	112	172	299	190	187	366	254
75160G/OO	140	200	396	259	215	417	277
11164C/FF	140	200	243	106	215	423	283
75121C/BB	249	309	349	103	324	425	176
75500C/RZ	292	352	396	107	367	423	131
13012C/OB	151	211	299	151	226	344	193
13014C/OB	151	211	299	151	226	475	324
13A14C/CD	357	417	482	128	432	578	221
13195G/OB	140	200	271	134	215	343	203
14216G/OB	217	277	299	85	292	416	199
23039C/CE	186	246	271	88	261	390	204
41061G/BB	272	332	399	130	347	459	187
41108C/BB	304	364	510	209	379	578	274
41223G/AA	254	314	422	171	329	473	219
42803G/CC	46	106	117	74	121	199	153
42804G/CC	330	390	482	155	405	522	192

F-16 SERD STATUS CONTINUED

SERD NUMBER	SERD DATE	603 DUE	603 RCV'D	603 DAYS	FORM 9 DUE	FORM 9 SENT	TOTAL DAYS
42814G/CC	346	406	482	139	421	522	176
42823G/CC	346	406	482	139	421	525	179
42807G/CC	46	106	117	74	121	213	167
42824G/CC	46	106	117	74	121	213	167
42876G/BB	110	170	208	101	185	277	167
42844G/CC	357	417	453	99	432	519	162
42683G/OA	239	299	339	103	314	426	187
75527G/AB	166	226	208	45	241	350	184
75132G/OO	233	293	482	252	308	551	318
76625C/BB	59	119	152	96	134	277	218
74313C/AA	59	119	117	61	134	277	218
46082G/BD	110	170	208	101	185	266	156
75098C/BE	213	273	333	123	288	475	262
75541G/OA	186	246	303	120	261	431	245
74L42C/AB	110	170	243	136	185	446	336
75539C/BB	249	309	333	87	324	368	119
75530C/DD	206	266	303	100	281	343	137
75542C/OA	186	246	271	88	261	343	157
24002G/AA	330	390	422	95	405	642	312
14272G/AB	357	417	453	99	432	519	162
14269G/AB	357	417	453	99	432	642	285
14A01C/BD	233	293	303	73	308	363	130
14K02C/OO	66	126	135	72	141	154	88
13005G/BB	249	309	349	103	324	420	171
13A11C/BC	197	257	240	46	272	363	166
24499G/OO	111	171	212	104	186	254	143
41187G/BC	30	120	180	123	135	277	217
42801G/DE	46	106	117	74	121	213	167
42838G/CC	346	406	482	139	421	551	205
42869G/AA	110	170	208	101	185	277	167
45052C/AA	36	96	74	41	111	107	71
01082G/EI	304	364	510	209	379	578	274
01091G/AA	51	111	135	87	126	232	181
11418C/AB	303	363	337	37	378	455	152
11419C/AB	303	363	337	37	378	455	152
11421C/AB	303	363	337	37	378	453	150
11708C/OA	353	413	414	64	428	450	97
11740C/OO	104	164	239	138	179	442	338
90533G/CD	206	266	339	136	281	401	195
90645G/BC	25	85	117	95	100	368	343
13181C/AA	152	212	300	151	227	474	322
13170G/CE	293	353	378	88	368	417	124
13A13C/BC	196	256	239	46	271	362	166
13A15C/BC	196	256	239	46	271	362	166

F-16 SERD STATUS CONTINUED

SERD NUMBER	SERD DATE	DUE	RCV'D	DAYS	DUE	SENT	DAYS
13A18G/AA	309	369	399	93	384	643	334
81N04C/00	46	106	181	138	121	351	305
81L22C/00	46	106	181	138	121	351	305
81N01C/OC	51	111	134	86	126	198	147
76636G/00	214	274	334	123	289	423	209
74316C/AA	60	120	118	61	135	278	218
74704G/BB	113	173	300	190	188	410	297
74K40C/AB	182	242	192	13	257	456	274
74K44C/00	60	120	181	124	135	351	291
74K49C/00	60	120	181	124	135	351	291
11736C/AB	111	171	159	51	186	278	167
13195C/00	236	296	343	110	311	364	128
13188C/00	236	296	343	110	311	364	128
13A06C/BC	196	256	257	64	271	336	140
13A09C/BC	196	256	257	64	271	336	140
14290C/00	232	292	407	178	307	484	252
14588C/AA	146	206	244	101	221	487	341
13010C/BE	293	353	396	106	368	423	130
24449C/BB	329	389	483	157	404	579	250
42835G/CC	345	405	483	141	420	552	207
42815G/CD	46	106	118	75	121	187	141
42813G/CC	329	389	483	157	404	552	223
42836G/CC	345	405	427	85	420	520	175
42839G/CC	356	416	454	101	431	520	164
42852G/CC	111	171	209	101	186	278	167
42666G/AC	238	298	427	192	313	552	314
46024G/DE	111	171	209	101	186	306	195
75124C/AA	250	310	460	213	325	471	221
76589G/BB	214	274	350	139	289	420	206
76591G/BB	214	274	350	139	289	420	206
23034C/CG	280	340	422	145	355	520	240
13159G/0B	152	212	300	151	227	406	254
13182C/AA	293	353	396	106	368	423	130
75541G/00	196	256	313	120	271	364	168
75061X/CE	280	340	425	148	355	499	219
42837G/CC	345	405	483	141	420	552	207
42853G/CC	357	417	454	100	432	520	163
AVG REVIEW TIME (Days):				112.4			205.5

B-1B SERD STATUS

SERD NUMBER	SERD DATE	603 DUE	603 RCV'D	603 DAYS	FORM 9 DUE	FORM 9 SENT	TOTAL DAYS
41G89G/O	244	304	366	125	319	420	176
23A83C/O	144	204	236	95	219	456	312
44A54G/O	288	348	356	71	363	427	139
45C22C/O	72	132	132	63	147	162	90
47A46G/O	205	265	357	155	280	427	222
51D37C/O	66	126	161	98	141	250	184
56A14G/O	48	108	181	136	123	299	251
58L18G/O	31	91	63	35	106	147	116
59L45G/O	31	91	63	35	106	148	117
63A31G/O	48	108	151	106	123	186	138
63A87G/O	48	108	168	123	123	186	138
64A39G/O	276	336	325	52	351	405	129
64A40G/A	61	121	178	120	136	186	125
11B73C/A	64	124	115	54	139	147	93
11B74C/A	64	124	115	54	139	147	93
11B85G/O	168	228	259	94	243	304	136
13E93C/O	338	398	601	266	413	541	203
13F03C/O	337	397	572	238	412	541	204
14G54G/O	64	124	120	59	139	141	77
24D69C/O	324	384	427	106	399	439	115
41G24G/O	275	335	408	136	350	471	196
41G58E/O	141	201	241	103	216	308	167
42D03C/O	87	147	125	41	162	266	179
47A49G/O	205	265	357	155	280	371	166
51D16G/O	136	196	189	56	211	301	165
55A85C/A	220	280	377	160	295	378	158
58L18G/O	31	91	63	35	106	148	117
59M92G/O	77	137	88	14	152	270	193
73U01G/O	281	341	322	44	356	433	152
73U13C/D	31	91	266	238	106	379	348
73U70C/A	314	374	377	66	389	463	149
76T06G/A	175	235	391	219	250	524	349
76U60G/O	313	373	379	69	388	463	150
99B42G/O	61	121	203	145	136	305	244
11B31G/O	64	124	121	60	139	141	77
11C03G/O	244	304	390	149	319	423	179
11C06C/O	123	183	235	115	198	173	50
11C17C/O	123	183	235	115	198	173	50
11C19C/O	123	183	235	115	198	173	50
14G95G/O	289	349	436	150	364	554	265
14H13G/A	338	398	380	45	413	428	90
14H18G/A	338	398	380	45	413	428	90
24E20G/O	324	384	427	106	399	635	311
24E29G/O	324	384	427	106	399	635	311

B-18 SERD STATUS CONTINUED

SERD NUMBER	SERD DATE	603 DUE	603 RCV'D	603 DAYS	FORM 9 DUE	FORM 9 SENT	TOTAL DAYS
41G49G/A	236	296	387	154	601	344	108
42C98C/O	87	147	124	40	162	266	179
42C99C/O	87	147	125	41	162	266	179
51C96G/O	275	335	387	115	350	453	178
51C97C/O	48	108	174	129	123	255	207
55A88C/A	220	280	377	160	295	378	158
63A30G/O	48	108	151	106	123	299	251
73J96G/O	218	278	260	45	293	385	167
73K89G/O	281	341	310	32	356	433	152
73K99G/O	281	341	353	75	356	439	158
73L63G/O	31	91	171	143	106	322	291
73L68G/O	242	302	274	35	317	322	30
73U08G/O	281	341	310	32	356	439	158
73U29G/O	281	341	415	140	356	439	158
73U33G/B	242	302	333	94	317	385	143
73U41G/O	281	341	522	44	356	439	158
73U59G/A	239	299	299	63	314	442	203
73U62G/O	238	298	300	65	313	420	182
75C54C/O	108	168	151	46	183	222	114
76Q69C/O	313	373	538	228	388	620	307
92L29G/O	77	137	87	13	152	265	188
98B46G/O	276	336	322	49	351	447	171
99B32C/O	342	402	592	253	707	582	240
99Q15G/O	276	336	366	93	351	405	129
10C42C/O	145	205	269	127	220	258	113
11B39G/O	63	123	126	66	138	153	90
11B71C/A	63	123	114	54	138	147	94
11B87G/O	169	229	264	98	244	305	136
13E70E/O	91	151	210	122	166	239	148
13E74G/O	140	200	190	53	215	239	99
14G49C/A	50	110	275	228	125	258	208
14G64C/B	71	131	131	63	146	162	91
14H56C/A	145	205	236	94	220	251	106
14H66C/O	56	116	235	182	131	176	120
24B26G/O	324	384	373	58	399	429	105
24D16G/O	341	401	400	62	416	638	297
24D99C/O	100	160	211	114	175	187	87
24E26G/O	324	384	428	107	399	636	312
24E11G/O	324	384	428	107	399	636	312
73J92C/A	314	374	619	308	389	667	353
73K90G/O	280	340	309	32	355	434	154
73K97G/O	280	340	352	75	355	434	154
73K94G/O	280	340	352	75	355	440	160
73L75G/O	78	138	152	77	153	273	195

3-1B SERD STATUS CONTINUED

SERD NUMBER	SERD DATE	603 DUE	603 RCV'D	603 DAYS	FORM 9 DUE	FORM 9 SENT	TOTAL DAYS
73L74C/O	30	90	62	35	105	148	118
73U61G/O	237	297	299	65	312	425	188
73U68C/A	314	374	377	66	389	470	156
73U84G/A	352	412	418	69	427	504	152
73U87G/O	305	365	347	45	380	433	128
73U90G/O	305	365	350	48	380	434	129
76U61G/O	313	373	379	69	388	464	151
76U68C/O	513	373	328	18	388	405	92
76U84G/O	39	99	98	62	114	207	168
76U87G/O	39	99	63	27	114	256	217
76U90G/O	39	99	98	62	114	238	199
99Q03C/O	275	335	391	119	350	621	346
99Q04C/O	275	335	391	119	350	621	346
99Q05G/O	275	335	328	56	350	405	130
99348G/O	67	127	118	54	142	190	123
99B49G/O	67	127	118	54	142	190	123
92L20G/O	78	138	109	34	153	273	195
92M05C/O	312	372	371	62	387	437	125
92M11C/O	312	372	371	62	387	437	125
76U94G/O	39	99	61	25	114	175	136
76U33C/O	313	373	391	81	388	551	238
76T34G/O	177	237	313	139	252	525	348
76S78G/O	174	234	243	72	249	406	232
76S86G/O	174	234	243	72	249	414	240
73U76C/O	314	374	439	128	389	468	154
73U46G/O	241	301	273	35	316	385	144
73U54G/O	280	340	321	44	355	442	162
73U37G/O	241	301	294	56	316	442	201
73U15G/O	30	90	100	73	105	332	302
73U21G/O	280	340	352	75	355	442	162
42D06C/O	86	146	103	20	161	265	179
42D14C/O	86	146	124	41	161	265	179
42C93C/O	86	146	124	41	161	265	179
42C95C/O	86	146	124	41	161	265	179
42C88C/O	86	146	124	41	161	265	179
41G45G/O	86	146	155	72	161	239	153
41G88C/O	300	360	571	274	375	553	253
24E22G/O	324	384	428	107	399	636	312
24E12G/O	324	384	428	107	399	636	312
41G60G/O	140	200	243	106	215	307	167
41G66G/O	245	305	377	135	320	420	175
42A91C/O	86	146	223	140	161	265	179
45C28E/O	147	207	215	71	222	394	247
46C84E/O	297	357	377	83	372	490	193

B-1B SERD STATUS CONTINUED

SERD NUMBER	SERD DATE	603 DUE	603 RCV'D	603 DAYS	FORM 9 DUE	FORM 9 SENT	TOTAL DAYS
23A81E/B	63	123	142	82	138	161	98
14G39C/O	145	205	194	52	220	258	113
14G57E/B	63	123	119	59	138	160	97
14G79G/O	204	264	341	140	279	429	225
11B97C/O	113	173	235	125	188	173	60
73U50C/A	352	412	418	69	427	525	173
73U65C/O	237	297	324	90	312	440	203
99B75C/O	145	205	235	93	220	267	122
99Q08C/O	275	335	391	119	350	621	346
76S83G/O	174	234	212	41	249	414	240
76S97G/O	174	234	265	94	249	525	351
76S92G/O	174	234	252	81	249	414	240
92L34G/O	78	138	81	6	153	266	188
92L35G/O	78	138	81	6	153	271	193
92M01C/A	314	374	377	66	389	464	150
92M07C/O	312	372	433	124	387	437	125
92M12C/O	312	372	371	62	387	437	125
99B78C/O	145	205	204	62	220	251	106
99B52G/B	137	197	286	152	212	302	165
99B53B/O	62	122	194	135	137	300	238
99B35C/O	110	170	187	80	185	258	148
99B36C/O	313	373	397	87	388	623	310
99Q23C/O	276	336	314	41	351	621	345
99Q20G/O	276	336	366	93	351	405	129
99B44G/O	62	122	195	136	137	190	128
AVERAGE REVIEW TIME: (Days):				90.2			177.5

The following SERDs were selected as part of the random sample but could not be included in the statistical analysis because (1) they didn't have an AFLC Form 603 or (2) the SERD review time exceeded the 365 day limit.

SERDS with no AFLC Form 603:

F-15	—— F-16 ——	B-1B
0417	42800	80654
0983	42845	42674
1531	75517	74890
2614	75536	74M24
8544	24447	
8594	42548	
9904	42615	
	42639	
	74M24	

SERDs exceeding 365 day review time:

F-16	————— B-1B —————				
63514	10A92	23A31	75M12	58M03	76Q35
24498	45A21	24B31	76Q06	65A33	76R24
42812	51A60	41C55	76R57	72A07	76R50
42877	61A03	42C58	76R95	72A14	76R53
75625	61A28	44A45	86D13	72A17	76R56
14702	99B34	46A52	86D16	72A45	76T46
11451	72A43	46B92	86D17	73L26	76S52
11453	72A43	59M28	97A96	73L47	76S64
11698	73L13	59M62	99A45	73N33	76R18
42668	12A22	72A33	13C33	75M01	76R32
13174	12A85	72A43	41F16	75M09	76R44
90772	13C33	73J08	45A07	76Q17	10A51
13183	13E56	73L13	51A10	76Q29	11A62
	14D11	73N87	51A25	92L02	99Q24

Appendix D: Interview Questions

For SPO Support Equipment Managers:

1. Does your organization process SERDs within the 75 days required by regulation? If no - what are the primary constraints?
2. Does your organization batch SERDs? Do you have different procedures for original SERDs versus simple administrative changes?
3. Have the legislative changes concerning competition and spares and support equipment overpricing affected the support equipment acquisition process? What is the impact to SERD processing?
4. Does your organization conduct Pre-SERD Reviews? What organizations normally participate? Do Pre-SERD Reviews improve the SERD review process?
5. What information do you receive from organizations outside the SPO that is needed to make a design decision?
6. Does SERD approval authorize the contractor to start designing the item of support equipment?
7. What are the primary reasons that your organization disapproves SERDs?
8. What method does your organization use for tracking SERD status?
9. Do you think the current SERD processing system is adequate? Are you able to meet the SE needs of the user? In your opinion, how could it be improved?

For SPM ALC Personnel:

1. Where do you distribute copies of the SERD when you receive them from the contractor?
2. Do you meet the 60-day review cycle? If no - what are the major constraints?
3. What type of SERD tracking system do you use? Do you follow-up on SERDS that exceed the 60-day review cycle?

4. Do you process SERDs in batches? Do the SERDs stay together throughout the review process?
5. Do you use different procedures for processing original SERDs versus simple administrative changes?
6. How are the AFSC/AFLC Form 9 or SERLs processed?
7. Does the SPO always forward AFLC requirements to the contractor?
8. Do you have any suggestions for improving the current system?

Appendix E: Listing of Interviewees

Mr. Joe David
F-15 Support Equipment Manager
Directorate of Logistics
Deputy for F-15
Wright Patterson AFB OH

Mr. Kim Butler
F-16 Support Equipment Manager
Directorate of Logistics
Deputy for F-16
Wright-Patterson AFB OH

Mr. Will Black
B-1B Support Equipment Manager
Directorate of Logistics
Deputy for B-1B
Wright-Patterson AFB OH

Ms. Vera Howard
F-15 Support Equipment Provisioning Manager
F-15 System Program Office
Robins AFB GA

Ms. Lee Frantz
F-16 Support Equipment Provisioning Manager
F-16 System Program Office
Hill AFB UT

Ms. Karen Goss
B-1B Support Equipment Provisioning Manager
B-1B System Program Office
Tinker AFB OK

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VITA

Joyce F. Bassett started her career in civil service in September 1976 as a GS-3, clerk typist at McClellan AFB California. In January 1978 she moved to Wright-Patterson AFB Ohio where she worked as a GS-5, procurement clerk at the 2750th ABW Base Procurement. After taking the Professional Administrative Career Examination (PACE) she was selected for training as a Logistics Management Specialist and was assigned to AFALD/SD. Between February 1979 and February 1984, she was assigned to the logistics organizations for the F-16, A-10, Air Launched Cruise Missile and Advanced Cruise Missile programs. In 1984, she was assigned to HQ AFLC/MMAQ as a GS-12 Logistics Management Specialist. She received a Bachelor of Science degree in Management from Park College in 1985 and was also selected as the Air Force Association's Acquisition Manager of the Year. In August 1985 she was promoted to GM-13 and was assigned as Chief of the Acquisition Management Division, F-15 Deputy Program Manager for Logistics Office, responsible for the acquisition of all F-15 peculiar support equipment and maintenance training equipment. In 1988 she was selected to attend the School of Systems and Logistics at AFIT and was promoted to GM-14. She is assigned to the Special Projects Directorate within the Deputy for Reconnaissance and Electronic Warfare Systems.

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There is a direct link between the increasing technological sophistication of our present-day weapon systems and the complexity of the support equipment required to maintain them. With this complexity has also come increased numbers of equipment at increased cost and lead times. In 1988, aircraft and missile support equipment alone totaled over 82,800 line items valued at over 10.5 billion dollars. The support equipment requirements and acquisition process that has evolved over the years is extremely complex and it requires the coordination of many people. As such, it is often characterized as being nonresponsive to the Air Force needs.

Since 1983, there have been numerous Air Force studies to address the support equipment issue. Over 200 recommendations have been made in an attempt to improve the support equipment acquisition process, yet support equipment shortfalls are still a major problem today. A literature review was developed to identify those studies, their conclusions and recommendations.

The purpose of this research was to determine if the current SERD processing is being accomplished within the 75 days required by regulation and to identify where the current process could be improved. The research was accomplished by selecting a representative sample of SERDs and by interviewing support equipment experts.

This research shows that the average time to review and approve SERDs is 176 days versus the 75 days required by regulation. The research concludes that the current process cannot be routinely accomplished within the 75 days allowed because there are just too many reviewers involved and the action of one reviewer is normally contingent upon the completed action of another. This report addresses problems and backlogs which were identified during the research and makes recommendations to streamline the current SERD processing system.

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